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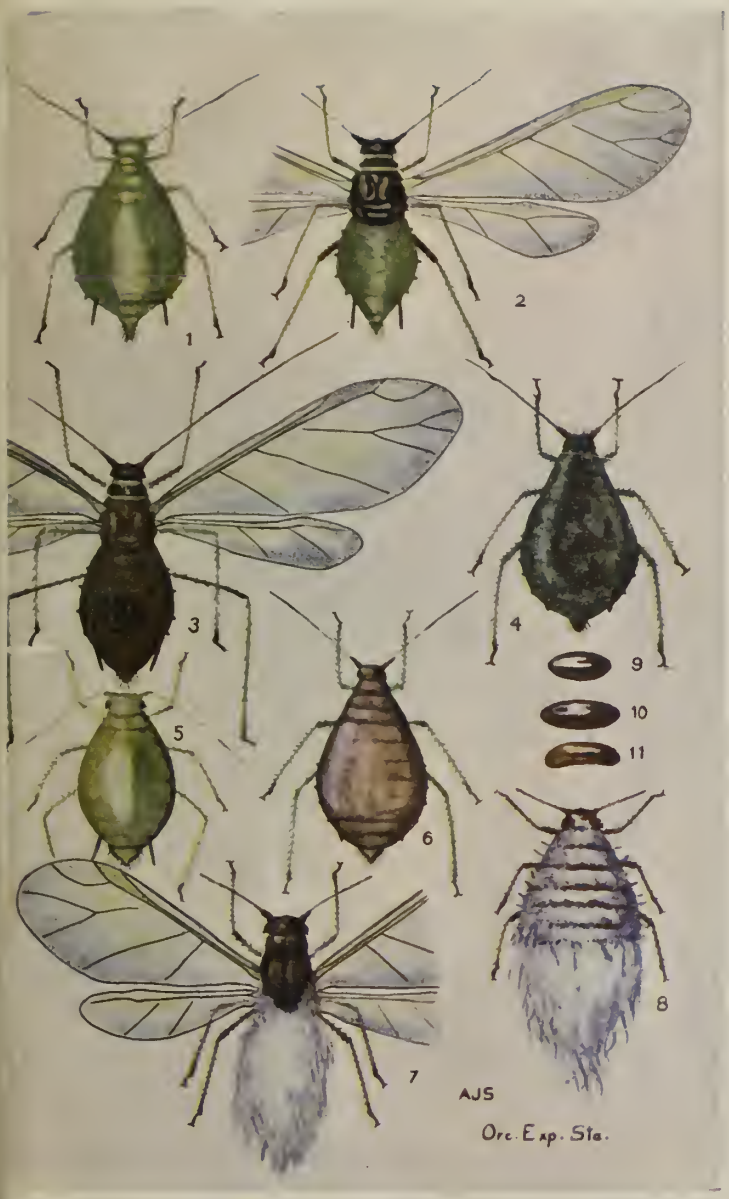
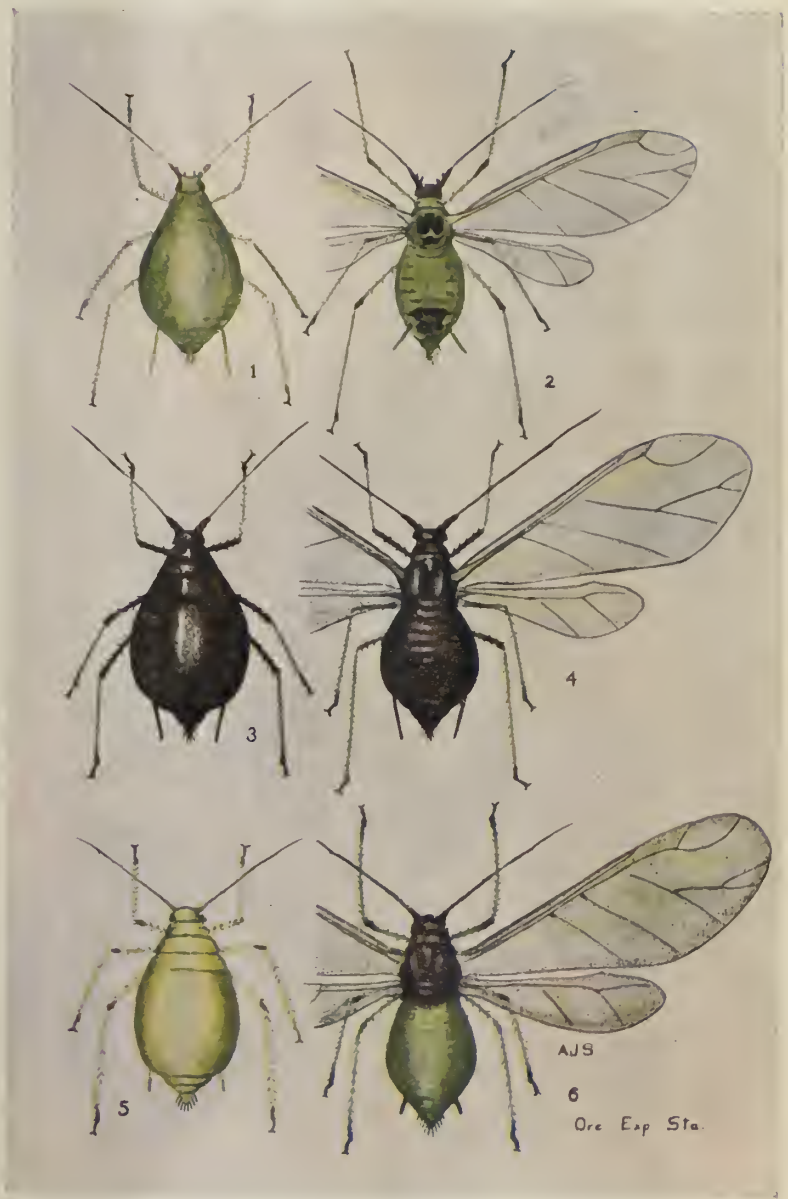


URES 1 AND 2—Green apple aphis. FIGURES 3, 4, 5 AND 6—Brown apple is. FIGURES 7 AND 8—Woolly apple aphis. FIGURE 9—Egg of brown le aphis. FIGURE 10—Egg of green apple aphis. FIGURE 11—Egg of woolly apple aphis.



FIGURES 1 AND 2—Plum-hop aphis. FIGURES 3 AND 4—Black cherry aphis. FIGURES 5 AND 6—Green plum aphis.

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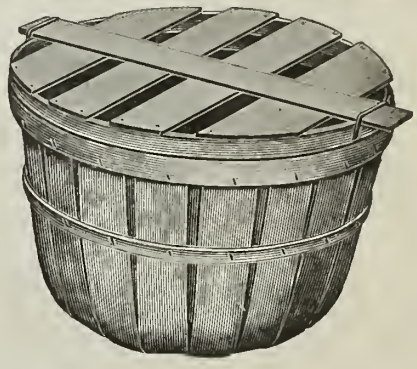

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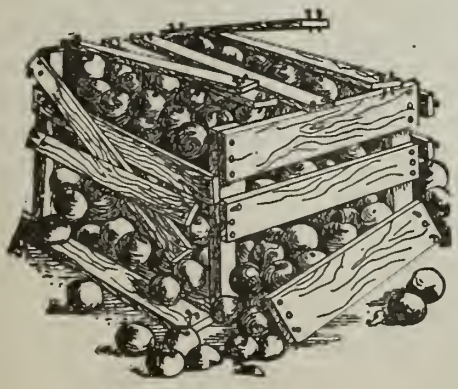

BEFORE using Cement Coated Nails

Western Cement Coated Nails for Western Growers

Our Cement Coated Nails are always of uniform length, gauge, head and count. Especially adapted to the manufacture of fruit boxes and crates. In brief, they are the Best on the Market.

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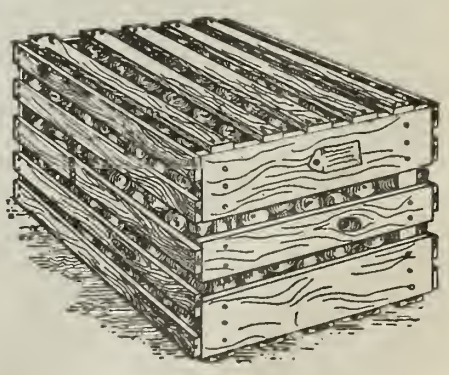

AFTER use of C. F. & I. Co.'s Cement Coated Nails

HOW TO FERTILIZE

Every farmer knows that plants need Food as much as cattle. He knows, too, that plants cannot get all the Food they need out of the ground alone. He must supply them with certain Foods himself, or they will not thrive and bear their full yield of fruit. Exactly as he supplies hay and oats to his horse, so he must supply Nitrogen and phosphate to his plants. He may buy these in the open market exactly as he does his hay or his oats, or he can buy them in combination. Moreover, there is no secret value in the "complete fertilizer," it is nothing more nor less than the ingredients combined and sold at a higher price. Nitrogen is by far the most expensive as well as effective of plant foods, and it will pay the farmer well to stop and think before he buys it in this combination form or waits season after season for legume nitrogen, or organic nitrogen to become available.

These compounds generally averaging 8-2-2 do not supply what nature requires, for the crops take out more nearly the equivalent of a 2-4-3; that is why we can in most cases and in most soils use Nitrate alone as a straight top dressing, and the earlier the better.

Translated into Commercial Fertilizer terms, the comparison is as follows:

	What Nature Requires	What the Average Brand Supplies
Phosphoric Acid	2.02	8.00
Nitrogen	4.33	2.00
Potash	3.65	2.00

BEST AND CHEAPEST NITROGEN

The cheapest and most practical form in which to furnish Nitrogen to plants is Nitrate of Soda. In the rainless region of Chile are stored away vast quantities of Nitrogen in what are known as Nitrates—the only form in which Nitrogen can be utilized by plants. The Nitrogen which exists in organic, vegetable or animal matter—that is, roots, stems, dead leaves, weeds, leather, tankage, dried blood—and also Nitrogen in the form of Ammonia salts, must first be changed to Nitrate before it can be taken up by plants. This change is dependent upon conditions of weather. If the season be backward or there be prolonged drought, this change may be so retarded as to deprive the plant altogether of Nitrate Food at the very time it needs it most; moreover, Nitrogen in the form of Ammonia salts leaves acid residues in the soil. Nitrate of Soda, on the other hand, is entirely independent of weather and leaves the soil sweet. It is immediately available under all circumstances, for it is readily soluble, and as soon as it comes within reach of the roots of plants it is taken up by them. It can, therefore, readily be seen that the practical value of various forms of Nitrogen ranges from nothing at all, where conditions of temperature or soil prevent Nitration, to 100 per cent as Nitrate of Soda, where Nitration has already completely taken place. Moreover, the process of transforming the Nitrogen of cotton seed meal, dried fish, dried blood, tankage, and other Nitrogenous constituents into Nitrate is very wasteful, for much valuable Nitrogen is lost in the process, as well as by natural oxidation. Official soil experiments have shown that 100 pounds of Nitrogen in these organic forms has only about one-half to three-fourths the manurial value of 100 pounds of Nitrogen in its nitrated form of Nitrate of Soda.

A GREAT SAVING

In view of these facts it seems extraordinary that farmers should continue to purchase their Nitrogen in compounded form in a ready-mixed fertilizer, when they can procure it much cheaper, and ready for the plants' immediate use, in the form of Nitrate of Soda.

Nitrogen is often in a form which is not available as food for the plants, for it must first be converted into Nitrate. The time required to do this varies from a few days to a few years, according to the temperature of the soil and the kind and condition of the materials used.

It must be recognized that the grower should have a chance to derive some profit from the use of a fertilizer, and wise buying is a prerequisite to successful use.

HOW IT HELPS CROPS

If a young pig or a young calf does not have an abundance of the right kind of feed when it is young, it becomes stunted in growth, and never recovers fully, no matter how judiciously it is afterwards fed. The intelligent cultivator has learned that this holds good in the feeding of plants. Nitrogen is the element which enters most largely into the building up of the plant itself—roots, stems and leaves. Most plants need to take up the greater part of their Nitrogen during the early stages of their growth, as in oats. It is plain, therefore, that the cultivator cannot afford to overlook Nitrate, and thus endanger the chances of his crops, which must have Nitrogen in a form the growing plants can use. The presence of Nitrate at the outset enables the plant to get its food when it needs it most, and develops a vigorous growth of roots, leaves and stems capable of withstanding the scorching rays of the sun or sudden changes of temperature, disease, or the attacks of parasites. It is then able to mature properly. Without Nitrate present, the young plant will fail to attain stem and leaf growth sufficient to mature its fruit or grain. Why take chances with makeshifts or substitutes when the real thing is 100 per cent effective?

Nitrate of Soda is of high value for early crops, such as peas, corn, beets, cabbage, where rapid maturity is desirable. It is a special help to hay, grain, rye, wheat, timothy, cereals and orchards, all of which are unable to obtain sufficient Nitrogen from the soil just when they need it. It is a great specific in the production of sugar beets, potatoes, cotton, cane and apples, or other fruits.

Small fruits, such as blackberries, currants, raspberries and gooseberries, which need a steady, even growth, are greatly benefited by Nitrate of Soda, which can be furnished all ready for digestion when the plants require it.

The highest agricultural authorities have established by careful experimentation that 100 pounds per acre of Nitrate of Soda applied to crops has produced the increased yields tabulated as follows:

Apples	100	bushels.
Barley	400	lbs.
Corn	280	"
Oats	400	"
Rye	300	"
Wheat	300	"
Potatoes	3,600	" Tubers.
Hay, upwards of	1,000	" Barn cured.
Cotton	500	" Seed cotton.
Sugar Beets	4,000	" Tubers.
Beets	4,900	" "
Sweet Potatoes	3,900	" "
Cabbages	6,100	pounds.
Carrots	7,800	pounds.
Turnips	37	per cent.
Strawberries	200	quarts.
Onions	1,800	pounds.
Asparagus	100	bunches.
Tomatoes	100	baskets.
Celery	30	per cent.
Hops	100	pounds.

Nitrate of Soda is a plant tonic, and an energizer; it is not a stimulant in any sense of the word.

It may be used alone without other fertilizers, as a top dressing, at the rate of 100 pounds to the acre.

HOW TO USE NITRATE

Recent experience suggests that Nitrate may be applied as a top dressing to best advantage as soon as growth starts in the Spring, or even better, before seeding or planting.

Generally in rainless or very dry countries staple crops root very deep in search of water and nourishment. Since there is little or no surface water to render plant foods available even when present, Nitrate of Soda should be thoroughly cultivated in, as should other fertilizers, so that they may may properly nourish the plant roots of the seeded and cultivated crops during the growing season. Most fertilizers should not touch the seed.

Nitrate has no acid residue to leave behind and it will leave nothing deleterious in your soil after using. It will enable you to overcome the effects of droughts and frosts in the shortest possible time and prolong the bearing period of your trees. Nitrate does not have to wait to get busy.

VALUABLE BOOKS FREE

Numerous books have been written on the value of Nitrate of Soda in agriculture. These books deal with questions on which progressive farmers cannot afford to form incorrect opinions.

If you are farming to make money you owe it to yourself to send for the free books which pertain to your crop. If you want to know what farmers have done both in America and Europe, who grow the same crops as you do, these books will tell you. If you have any doubts on how valuable Nitrate of Soda would be to your particular crop, you should get all the available information you possibly can on the subject.

These booklets are free—write for them, addressing

DR. WM. S. MYERS
CHILEAN NITRATE COMMITTEE
25 Madison Ave., New York

Why Europe Makes Bigger Crops Than the United States

Average Production of European Crops is as follows:

	Per Acre
Wheat	33 bushels
Oats	45 "
Potatoes	199.84 "
Cotton in Egypt	400 pounds

Europe uses a Home-Mixed Nitrate Fertilizer containing 8 per cent of Phosphoric Acid and 4½ per cent of Nitrate Nitrogen.

Average Production of American Crops is as follows:

	Per Acre
Wheat	14 bushels
Oats	40 "
Potatoes	97.15 "
Cotton	185 pounds

America uses a Fertilizer containing 8 per cent of Phosphoric Acid and 2 per cent of Nitrogen which is mostly not readily available.

The difference in yields is largely due to larger amount of Nitrate Nitrogen used in Europe per acre as **Nitrate of Soda.** Our small American acre yields are due to failure to appreciate this necessity.

Write for "What Chilean Nitrate Has Done in the Farmer's Own Hands."

CHILEAN NITRATE COMMITTEE, 25 Madison Ave., New York

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Comparative Results in Controlling Codling Moth

By Leroy Childs, Entomologist and Plant Pathologist, Hood River Branch Experiment Station, before Oregon State Horticultural Society, 1918

SPRAYING for the control of the insect pests and plant diseases of our various orchard enterprises is one of the most laborious and at the same time costly practice pertaining to fruit growing in most sections. The apple particularly is subject to the attack of many pests of widely different life habits which demand the use of a variety of materials that control may be effected. The application of this variety of materials often means the necessity of applying numerous applications in the orchard each season. To the average orchardist of medium to large holdings the time element is involved in spraying practices is the all important fact, or rather than the cost of materials. This time factor, together with the recent shortage and high cost of orchard labor, has led to much activity in seeking out more rapid and at the same time equally effective methods of applying spray. The familiar three-horsepower sprayer and 12-foot rods, when used in competent hands, has been productive of good results in the control of our various troubles in the apple orchard. Nevertheless, in the face of six or eight applications a season this protection was usually accomplished in orchards of twenty acres and larger at the expense of some other orchard practice of nearly equal importance when looking into the future demands of the plantation.

The most promising outcome of investigations relative to the reduction of this time element in spraying has been the development of the dusting method (the use of insecticides and fungicides in the form of dust) and the spray gun. The latter adaptable to the old power sprayer or much more preferably to be used on a machine developing much more horsepower than is at present generally used.

Of the two methods the dusting system is the older. Experimental work has been under way in the apple orchards of the East (notably New York State) for six or eight years. Reports from this section as to all around usefulness and effectiveness are more or less contradictory. Some investigators and growers are very enthusiastic in the praise of the system; others are much less so, even to condemning it altogether.

The writer has had the opportunity to test out the dusting method for the control of codling moth and apple scab during the past three seasons, 1916, 1917 and 1918. Two types of standard power dusters have been available for the work and extensive tests have been carried out under typical orchard conditions in the Hood River Valley.

From the standpoint of scab control 1916 proved to be the only year during which scab was sufficiently prevalent to enable the drawing of any reliable figures. That was a very favorable year for scab development, rainy, cold weather prevailing throughout spring and early summer. The fungus was held well in check on the dusted block, six applications of very finely-ground sulphur being used. This was the first season of the dusting investigations in this section and it was deemed wise to first determine whether there was merit in the system from the standpoint of actual control—hence the keeping of the trees well coated with a fungicide during the long wet spring and early summer. In justice to the effectiveness of the dust it must be said that very good control of the disease was obtained. The results obtained compared very favorably with those obtained in a nearby lime-sulphur block to which four applications of lime-sulphur spray had been given. The unsprayed check trees developed 60.22 per cent infection, while the dusted and sprayed blocks developed but 4.25 per cent and 2.65 per cent, respectively. A peculiar spray injury developed in the orchard during that season in the form of a calyx end rot. This injury was very much more pronounced in the dusted than in the sprayed block—perhaps brought about through the use of extra applications—amounting to 32.03 per cent as compared to 14 per cent on the sprayed trees. This particular type of injury was quite prevalent throughout the valley in 1916 and was probably intensified by unfavorable weather conditions which prevailed that season. One of the most striking features in comparing the sprayed and dusted trees, one with the other, was their foliage condition during the early summer. There is no doubt but that continued use of lime sulphur during the early season retards foliage development through burning and in some instances defoliation of the early-appearing leaves. On the dusted trees no such injury occurred and the trees obtained their maximum full foliage fully three weeks earlier than the sprayed trees. In the fall the dusted trees turned yellow much earlier than the sprayed trees, seemingly to indicate that their functioning was completed that much earlier than the sprayed trees. These trees have been dusted continuously for three years, but regardless of this foliage condition there seems to be no difference in the general vigor and fruit-bearing qualities of the sprayed and dusted trees.

Scab developed sufficiently in but one of the experimental orchards in 1917 to enable the drawing of any definite conclusions from the standpoint of scab control. The infection existing at harvest time on the unsprayed check trees amounted to 24.21 per cent. In the dust block the material was applied four times and in an adjoining lime-sulphur block the spray was three times, the last application being omitted, due to the fact that sulphur injury was feared on account of existing hot weather. The action of this material under such conditions being thoroughly established. Very good control of scab was obtained in both experimental plots. The lime sulphur again leading slightly with but .75 per cent scab-infected fruit; .95 per cent infection developed on the dusted trees. The last application of sulphur dust caused a typical sulphur injury to the fruit of about 7 per cent; on the sprayed trees one-half of one per cent occurred. This indicates clearly that sulphur dusting, along with other sulphur compounds, cannot be safely used on apple trees at times when hot weather can be expected. In 1918 no scab developed on the unsprayed, dusted and sprayed trees on account of unfavorable weather conditions (from the standpoint of the life habits of the fungus) in any of the experimental orchards, with a result no further data from the experimental standpoint was obtained.

Continued on page 41.

AN OREGON LOGANBERRY FIELD

Loganberry Culture in the Willamette Valley

By C. M. LaFollette Amity, Oregon

MY experience in Loganberry culture dates back seventeen years, my father and I having planted the first commercial patches in this state. My father planted one-half acre in the year of 1901 and in the following year I planted seven and one-half acres on my farm, where I now reside, located in Wheatland, Yamhill County, Oregon. This was the largest planting in the state for several years. Little was known of this wonderful fruit at this time, having been introduced into this state from California, where it was propagated by Judge Logan, from whom it derives its name. This berry is a cross between a red raspberry and the wild blackberry, oblong in shape, oftentimes measuring one and one-fourth inches long and three-fourths of an inch in diameter, when grown under extremely favorable conditions. The color is a rich maroon to a very dark red as the berry develops with age. The following season after planting my seven and one-half acres (sixteen months later), I harvested seventeen hundred and fifty crates of twenty-four pounds per crate from this patch, a little less than three tons per acre, which is considered a very good yield for the first crop. The next year I picked thirty-seven hundred and fifty crates from this patch, or six tons per acre, which was about my average for several years, or until market conditions justified me in destroying this planting. The first year my father and I had some difficulty in disposing of our crop. We contracted same to parties in Portland at $1.15 per crate of twenty-four pounds f.o.b. boat, the buyers to furnish crates. After we had delivered the first three days' picking we received a telephone message for us to come to Portland, that the berries were arriving in very bad condition. When we met the buyers they claimed they were short-weight boxes, not full, and a lot of other faults, so we weighed several crates, all of them over-run from one to two pounds per crate. Then the buyers said, "Gentlemen, we may as well acknowledge we are up against it; we cannot sell them; people do not know what they are and are slow to take hold. If you will cancel the contract we will give you all we have made so far." We called the deal off and hired one of these men by the day to handle the berries for us. He canvassed the city and sold where he could, and in this way we managed to dispose of our first crop, although we failed to get as much as the contract price. Next season was a different story. The Portland people, as well as other people, had got a taste, with the result that we didn't have enough to go around. The commission men would call me up by 'phone, ask my price, place their orders for from fifty to two hundred crates, to be shipped as soon as possible, which was generally three or four days later, as we had more orders than berries. And so it went for several seasons. We sold plants every spring and presently there were a lot of us raising Logans, and then we raised more Logans until our market got top-heavy, and you can guess the result. We formed a Loganberry Union at Brooks, Oregon, and tried shipping East and other points to relieve our local market congestion, but all without success. This was about ten or twelve years since. The Logan had not developed as a commercial canning berry at this time, the dried product experiments still in its infancy, and the juice as a commercial article unknown, save by a few who choosed to stock up their cellars to quench their thirst before the drouth struck the state. I was one of the first to quit the game, had English walnuts set in this berry patch, so took out the berries and put in peach fillers between the walnuts. Since then I have planted more, and bought a small patch, until I have at present about four acres. We expect to plant about fifty acres one year from now on a place we purchased this winter in Multnomah County, this state, near Fairview. This berry will grow almost anywhere in the Willamette Valley, Western Washington and California, but is especially adapted to the Willamette Valley. As you go farther south the climate is a little too warm and dry to obtain the best results, although while the Loganbery will grow on most soils, as do other berries, it thrives best on heavy clay loam or rich river bottom sandy soil. I do not recommend light sandy soil for the best results. A great deal of our prairie soil, where it has good water drainage, is well adapted to the plant, and some of the best patches we have are to be found in these locations. Also we have some very good patches in the foothills, but as you get higher up the berries are more inclined to dry out in the hot summer months. The Loganberry will not thrive in cold climates. When the mercury drops below ten degrees above zero the vines will perish. Several years ago it reached this point in this valley with the result it killed all the vines above the snow level. There was about one foot of snow then. The best time to plant is in the spring, usually during the month of April, or as soon as you can get good, strong plants and the soil is in proper condition. They may be set during May with good results. The plants should be from four to six inches high before planting. Good plants can be secured at a price from fifteen to twenty-five dollars per thousand, depending on supply and demand; are selling for the latter figure at present. It requires six hundred and eight plants set eight feet each way, or seven hundred and seventy-five plants set seven by eight feet apart, per acre. They should be set about eight feet in the rows with the rows from seven to eight feet apart. I believe seven feet apart for the rows is equally as good, as it makes more shade for the ground, also with the advantage of one-seventh more rows on the same space. The following fall or winter they should be trained up. For this we use from three to four wires No. 12 size. Three wires will do very well, but four is much better. The bottom wire should be about eighteen inches from the ground and the top wire from four to five feet, the latter preferable for heavy soil. Put in good anchor posts for the ends of the rows, and set a post every four plants, or thirty-two feet, thereafter. Always plant the rows to run north and south if it is practical, as it divides the sunshine to both sides of the row. In training the vines they should be distributed equally over the wire and trained as

Continued on page 35.

Prune-Tree Culture in the Great Pacific Northwest

By Elwyn D. Seaton, Santa Rosa, California

IN reply to your request that I write an article on prune-tree culture for your journal, BETTER FRUIT, will state I am delighted to present such facts as I have learned, after many years of the most intensive application and study of the subject. Oh that I could coin language to picture to your readers my vision of the possibilities of the future horticultural industry of the Pacific Coast States, with their rich valley lands, where the sedimentary soil is of almost unlimited depth.

No study can have a grander material significance than the one which gives us the knowledge of the causes of fertility. The thrill of pleasure of being able to pass on to others some practical knowledge gained by constant work and observation is compensation indeed.

I have traveled many thousand miles, in this and other states, in order to learn conditions in hundreds of orchards and fields. I discovered that in practically every orchard there are to be found one or more highly distinguishable trees. No matter how poor or neglected the orchard may be there are always some noteworthy trees; and from a careful study and examination of such trees much valuable knowledge has been gained. In a forty-year-old prune orchard, where the trees are standing 15 by 16 feet apart, two trees in particular have given me a fund of knowledge. A record of these trees has been kept for some fiifteen years; during that period an average of more than a thousand pounds of fresh prunes per tree has been attained each year.

I am positive wherever one finds an exceptional tree growth, or any other exceptional vegetable growth, more soil bacteria will be found than where the growth is less prolific.

Beyond all calculation and comprehension are the powers and mysteries of the working of the infinitesimal microbe workers of the soil. Unquestionably crops are made certain by the presence of this bacilli. Eight years ago I completed my study and investigation, and matured my plans for planting a fifty odd acre field to fruit trees with a full expectation that they would produce an annual net income of six per cent on a valuation of $5,000 per acre when the trees were in full bearing. At this stage of development they are exceeding my most sanguine hopes as to development and production.

The field was divided. Gravenstein apples and French prune trees were selected for the test as being best adapted to the location and the soil; also for the reason that we consider the two, in their order, the King and Queen of all the fruits, and hence we find a much greater joy and pleasure in watching their development. The year preceding the planting of the orchard the land was put in the best of physical condition.

The ground was laid off in twenty-eight-foot squares. Holes three feet deep and three or four feet in diameter were dug in each corner, some minerals were scattered in the holes, which were then about half filled with soil fully alive with soil bacteria. The trees were then carefully planted by having the soil in the pit cone shaped, the roots being separated and equally distributed around the cone and trained so as to extend downward, thus encouraging the deepest rooting possible. The trees now give the most splendid evidence of the wisdom of this method.

Sub-soiling and very deep cultivation has been constantly maintained since planting. This has been accomplished with much difficulty, because our soil is naturally cold and tenacious, and during the wet season runs together and packs—in other words, a very refractory soil, which has systematically been redeemed from such condition by the above method of tillage and by the extensive winter cover crops.

French prune tree one year old from planting. All trees planted were one-year-old grafted trees.

French prune tree eight years old from planting. Estimated better than 1,000 pounds green fruit.

The two main thoughts I had in mind before planting this orchard were: first, that the large majority of the trees planted would produce profitable crops for a hundred years at least; second, that the vigorous development and long life of the trees, with heavy fruitage, would depend upon the successful propagation and maintenance of the soil bacteria.

The one prominent thing proven beyond question by our intensive application and work, by the application of various minerals salts, by extending the season of cultivation and by varying the time and method of pruning, with careful daily notations, is that tree and all other vegetable development is always in proportion to the development of the soil bacteria. That is to say, the greater the quantity of bacteria in the soil the greater and more luxuriant will be the vegetable growth.

If there are any doubting Thomases as to this fact I suggest that they make a test by taking two lots of soil, one to be highly pregnated with a legume soil bacteria and the other soil to be made perfectly sterile and so maintained through plant growth. Sterilized water only should be used in irrigating this latter soil. The seeds for both plantings should be from the same lot.

It is a lamentable fact that, after all of the years of agricultural study and investigation by state and nation, one is unable to find in the agricultural department at Washington, D. C., or elsewhere, carefully compiled data and definite information on the best methods of developing the proper and best soil bacilli. The soil should be made to teem and fairly hum with myriads and myriads of the legume bacilli. They are the most indefatigable workers, never idle night or day. They keep the soil wholesome and prepare from it the proper food, and it is so prepared that the plant can take it up and assimilate it easily and quickly.

They mull over the earth and mineral salts even the hardest and most dense of substances. In this way phosporus, potash, magnesia, sulphur, iron, lime, sodium, lithium, and who knows how many more are made available, each one in its proportion, just as essential to the tree's growth and fruiting as the other, and when these bacteria have been developed on the roots of legume plants they make available free nitrogen from the air.

It is obvious that the clovers, the vetches, the peas, the beans and many other plants are dependent for their growth upon their peculiar bacteria, and growth is in proportion to bacteria development upon their roots. Is not such a fact illuminative, and taking our cue from this fact, should we not make every effort to supply to the very limit these ever industrious underground workers for all vegetable life?

It is a source of great satisfaction to take a part in the care of the orchard and to observe the teams or tractors

plowing, sub-soiling or cultivating deeper and deeper, making that dormant soil available by oxidation and liberating the stores of nutritious elements which have been so securely locked up for ages, and thus furnishing the trees with an ever deepening feeding zone. It is in these greater depths that the foundation is laid for splendid fruit trees with sturdy trunks and vigorous limbs. Deep rooting is a great protection from root infection and from the attacks of the numerous enemies of the deciduous fruit trees.

The orchardist should never forget that it is his part to see to it that this feeding zone, to its utmost depth, is kept in a perfect habitable condition for our underground workers that the All-Wise Providence supplies, so that they may always have a warehouse full of prepared tree food. There will be no question about the roots pushing down with eagerness to secure choice morsels especially prepared for the nourishment of the tree. We are eye witnesses to the fact that where choice plant tid-bits have been placed underground numerous root tentacles, with true tree intelligence, have found their way down to them, and weaving themselves in and about the substances have absorbed the nourishment contained therein. May we not truthfully say that by deepning the zone feeding we have increased our acerage many fold, if not in length and breadth, surely in thickness.

The accompanying photographs show something of the comparative yearly growth and fruitage of our trees.

Among some of our records that we have kept, those of root and branch growth we make reference to with much satisfaction. The fourth year's root growth did show plainly interlacing of roots by trees standing twenty-eight feet apart. It has been interesting to watch this development, which we are confident from close observation now extends over forty feet from the trees bearing them. It is practically impossible to overestimate the vitalizing efficiency of our rooting system, backed up by soil bacteria. The manifestation of it is clearly defined in the appearance of the trees, uniform growth, deep green luxuriant foliage and remarkable branch development. Instances have been noted where the new branch growth has been as great as an inch a day for months at a time. From a painstaking estimate which may be considered fairly accurate, we found the branch growth of the tree in one season to total more than 2,500 lineal feet. Using the same care in determining the leaf area of the tree's foliage it was found to contain (both sides of the leaves) some 6,000 square feet of surface exposed to the air. It takes time to observe and appreciate fully the dynamic energizing force developed by this root and foliage system. It will be interesting to note in this connection that our trees have been grown without artificial irrigation, their sole dependence for moisture being upon the winter rains.

French prune tree four years old from planting. Two hundred and fifty pounds green fruit. The lack of spread of all trees is due to their being drawn together by rope, to prevent breaking down on account of the heavy crop. From $400 to $500 was paid out for twine for this purpose, and likely 30,000 to 40,000 feet of lumber used.

It is evident that the great problem is that of supplying nutritious fruit-tree food, that is food which contains all of the proximate elements of the tree body, in the proportions to supply the process of growth, repair and fruitage. Food to be nutritious must be digestible, that is soluble in the fluids of the tree's alimentary canal. I am convinced that it is the Divine plan that this food has to be prepared by the soil bacteria before it can be assimilated by the trees. A man's part in the game is to see that the soil is in the finest and best condition,—viz like an ash heap,—for the bacterias' activities. They cannot live in the sunlight, but they do require the oxygen. Hence our summer cultivation must be for separating the soil particles and mixing them so as to make a loose homogeneous mass through which the air can easily circulate.

To the frequent question asked on how to make trees grow, my answer always is just love it, then give it more love. How can you help loving trees when you plant a tree with your own hands and later see it respond so gloriously to your care, producing its fruit in generous, even lavish abundance for yourself, your children and even your children's children. Has it no claim upon your affection? There is no love in the world that reciprocates with greater abundance than the orchard. You give it of your best intelligence and intensive care; it gives you back more than a hundredfold. I cannot conceive that it is within the range of possibilities for a man to bring an orchard into its full perfection who never kisses his wife or children. To such a one the flowers do not bloom or give of their fragrance, nor does the fruit tree give of its beauty and lusciousness.

Summary for Planting a Prune Orchard

First. The orchardist should get a vision of the splendid possibilities opening out before him. That each tree planted must eventually be equal, if not better, than the best trees so far produced in the world. It is helpful towards better development if we get it thoroughly in our minds that we are only trustees of our land holdings. That it is incumbent upon us to pass on the land so held to the next generation in a better physical and more fertile condition that when received, and so on from generation to generation. This is progress per se. A new aspect is presented when we realize that cultivation means more bacteria, hence more fertility.

Second. A thorough preparation of the field before planting. Better root ramification in most soils can be secured from an excavated hole than from a blasted one, as the blasting tends to pack the soil at the sides and at the bottom. The cost of blasting material and labor for blasting will defray the cost of digging a good-sized pit, with added advantage of being able to inoculate the deep soil with bacteria. A practical method of soil inoculation is by taking a bunch of alfalfa or clover roots with numerous bacteria nodules thereon and depositing the same in the excavation. If the soil environment is good the rapid development of the bacteria will be marvelously great. When refilling the hole, throw the soil to the center so as to form a cone; when the proper height is secured place the tree thereon and carefully separate the roots around the cone, being careful to have the tip of the root pointing downward. Much care should be taken with the first dirt placed around the roots; only the best soil obtainable should be used for this purpose, then firmly pack around the

Branch from a six-year-old prune tree, 121 inches long, grown in about 120 days. The tree had a very heavy crop of fruit.

roots. **Caution**—Never allow more than a very little dirt above the union of the bud or graft. This is of vital importance. The tree is very susceptible to infection at this point of union. Great care should be exercised in the selection of the trees to be planted. Only such should be used as have been developed from proven trees of vigorous growth and abundant fruitage of good size. All trees should be rejected that have imperfect grafted unions or that show any other imperfections. Extra money is well expended in securing selected trees.

Never top back a prune tree. I say this knowing that there will be much criticism from many horticulturists. Years of experience have proven to me beyond question that it is a very bad and injurious practice. Foliage and root development go hand in hand, both equally essential to tree development. The tree should only be pruned during the dormant season. All branches should be cut back to the parent limb. All wounds from pruning or otherwise should be surgically clean, and protected thereafter.

Important: Special care and observation are required for the first few months after planting, as this is one of the most critical times of the tree's life. The nursery tree has sustained a serious shock in transferring from the nursery to the field. A stunted tree is not worth time nor labor and should be removed and replaced by a better one. A winter legume cover crop should always be secured as an aid to increase soil bacteria and soil conditions.

Maintain active leafage after harvesting the fruit, that the fruit spurs may be properly developed for the following year's crop.

If the fruit tree's physical economy from center to circumference is never allowed to become impaired by lack of nutrition, or otherwise, I am confident one hundred years of fruitage may be expected.

The Productive Mortality of Prunes

By Earl Pearcy, Douglas County Fruit Inspector, Roseburg, Oregon

HOW long will a prune orchard continue to bear profitable crops of fruit? When will the decline of old age begin to take place? These questions are giving a great deal of concern to the prune growers of the state, who realize that sooner or later their orchards must fall prey to senility. The common impression is that the prune is a short-lived tree whose span of life would require three generations to equal the Biblical allotment to man of "three score and ten." Records show that the walnut tree will live to a very old age. What is there, then, about the prune that limits its productive period to a comparatively few years?

This matter of old age in our prune orchards is deserving of study because the prune industry of late years has been a profitable branch of horticulture, and if there is any practice or operation within the power of the orchardist which will lengthen the bearing life of his trees or which will delay for a few years the hand of Time, it is well that we find what it is. There is a suspicion among observant growers that the early demise of prune trees may to a considerable extent be preventable. Such may be the case.

A study made of the prune orchards of Douglas County, in company with Professor H. P. Barss, pathologist of the Oregon Agricultural College, during the summer of 1918 unexpectedly revealed a condition that prompted this inquiry into the matter of old age. Heart rot, a term used for a group of diseases which cause the decay of wood, was found to be present in many, if not all, of the orchards over twelve years of age. In many instances the rotten tissues had encroached upon the sapwood of the tree until it was evident to the most casual observer that the productive vitality was seriously reduced. The wonder often was that the tree could still be bearing at all. It would seem at first thought that it must take its entire energies to keep barely alive.

The situation proved so appalling, corroborating as it did some earlier observations of the California Experiment Station, that the Agricultural College immediately issued a pamphlet on "Heart Rots and Their Prevention," which was sent out to the prune growers of the state in the hope that orchard practices which were apparently responsible for this damage would be changed and precautions taken to safeguard young trees from this disease. The barking of the trees, either by cultivating implements or by the poles of the shakers, can easily be prevented. All pruning surfaces, especially those on large limbs or the trunk, should be protected by Bordeaux paste or disinfected in some permanent way to prevent the spores of the rotten-wood diseases, which are constantly present in the orchard, from securing a foothold from which to commence their encroachment into the heart wood. Once within the tissues of the tree there is no practical remedy.

Forty-two year old Petite prune tree.

A second phase of this inquiry led to a study of the damgae done by the Prune Root Borer, which for several years past has been under suspicion by prune authorities, who have thought that the injury done by this inconspicuous little pest was much greater than commonly suspected. The life history of this insect is such that aside from the short time spent during the summer in the moth, cocoon and egg stage, the greater part of the year is passed as a larva in the tree, where it destroys the cambium layer or growing tissue of the inner bark. Much of this injury is hard to detect as the borer confines its attention for the greater part to the region of the tree from the surface of the ground to a distance of several inches beneath.

Practically every prune district, or one might say orchard, in the Northwest is affected by the borer, the intensity of the attack varying from year to year, for unknown causes, in the different localities. As this worm does not directly attack the fruit, and thus make its damage visible as is the case with the Codling Moth larva of the apple, the average grower is unaware of the total loss suffered annually. The mortality among young trees is often very high, necessitating a 10-per-cent replant in many cases. As the circumference of these small trees is not great the chance of their being completely girdled is more to be expected than for the old trees, although the loss of old trees is frequent enough to cause a large amount of dead space to occur in the average orchard. Growers complain that it is sometimes difficult to make the replants live when set out in the old orchards, and after such an experience these men cease attempting to fill in, thus losing available prune space and increasing the overhead per acre.

Undoubtedly the greatest loss comes about indirectly, because while the burrows of the pest may in most instances fail to completely girdle the tree, the actual destruction of such a proportion of the sap transmission tissue must tend to greatly weaken the tree. How much of the sudden summer drop of fruit, or of the small, inferior,

prematurely or immaturely-ripened prunes can be laid to this damage? It is apparent that such decrease in the sap supply during the growing season must affect both the present crop and the actual strength or vitality of the tree, which by weakening the buds for the coming season may be responsible for much of the failure to set fruit, to withstand rains and light frosts and to resist the varying influences of the weather, such as the dry spell during the season of 1918. It is a common observation among prune growers that some trees better resist these conditions and, regardless of the seasonal set-backs, manage to mature a heavy crop of large prunes in which, of course, lies the profit. Trees which for one reason or another are simply able to keep the life forces going without producing large crops, are certainly of no more value to the orchardist than the "star boarder" is to the dairyman.

While many growers have a patent nostrum or supposed cure for the Prune Root Borer, the fact remains that, to date, there has not been found a reliable, practical, economical remedy. Investigators have worked on it from time to time but have given up the task after a short period. Due to its habits of life, this pest presents difficulties in the way of its control that have not yet been overcome. Many thousands of dollars have been spent by the prune growers in tar, asphalt and in various protectors without any very evident results, aside from discouragement. The only remedy remaining of value seems to be the old standard one of digging out with a knife, which is laborious, inefficient and, very often, more destructive to the tree than the ravages of the borer itself.

We estimate a loss from death of trees, lowering of the vitality and money spent on remedies, at no less than $100,000 for Douglas County alone in a year. The Experiment Station at Corvallis has taken up this problem in earnest and it is to be hoped that some solution may be discovered which will relieve the prune industry of this heavy toll.

It is open knowledge that the average prune orchard in Oregon is not given the care and attention that its return on the investment demands. The young trees are looked after fairly well, but as soon as they begin to produce prunes many growers seem to be of the opinion that their interest in the matter has ended and that the orchard will take care of itself from then on, aside from an accosional cultivation and spraying. Our figures indicate that, with the soil factor considered, the average orchard will produce in proportion to the condition it is kept in by its owner. Certainly the high producing orchards, year in and year out, are the best cared for orchards. The prune responds to attention more than most species. Some tracts manifest resentment at neglect in their dilapidated appearance, and even more in the poor returns they grudgingly yield, while others responding to care, attractive, well groomed and vigorous, return thanks to their owners in prodigal harvests.

The mossy, brushy, no-growth orchard is not a money maker, even in these days of prosperity in the prune business. Fifty per cent of the prunes are found on the two and three-year-old wood. Where pruning, spraying or early, level and continual cultivation can remedy the slothful habits of an orchard we have no suggestions to make, since there is no excuse for such a condition. But where a failure to grow healthy, strong, new wood or to set and mature a heavy annual crop of fruit is due to lack of humus, nitrogen or moisture in the soil we are hopeful that certain practices may be put into effect which will convert many of these old orchards over into the profit column, or, in other words, will tend to stay the hand of old age.

Western Oregon and Washington are not in the so-called irrigation belt, yet, as is well known to every farmer, there are seasons when unusual weather conditions prevail during the growing period which makes this country similar to semi-arid regions where the lack of sufficient moisture must be supplied artificially. The season of 1918 was very dry, and in Douglas County the orchards suffered greatly for water where, had an emergency irrigation been present, the yield would have been much greater. In other words, while irrigation is not necessary under normal conditions there are times when it would have paid for itself many times over, and growers in this county, recognizing this, who happen to be situated along the river bottoms, are prepairing to install irrigation systems. Since many of these men have already added tractors to their orchard equipment, and these can be utilized as source of power, the cost of installation will not be great. The entire outfit, counting pump, pipe and flumes, aside from the tractor, cost one grower less than $400, which irrigated more than fifteen acres and had a capacity sufficient to water much more acreage. He estimated that this initial cost was more than returned by the increased size of the prunes in one season, in addition to which he had to his credit stronger fruit buds and new growth which will return a profit the next year. Where the moisture condition is the health-limiting factor it is possible

Continued on page 38.

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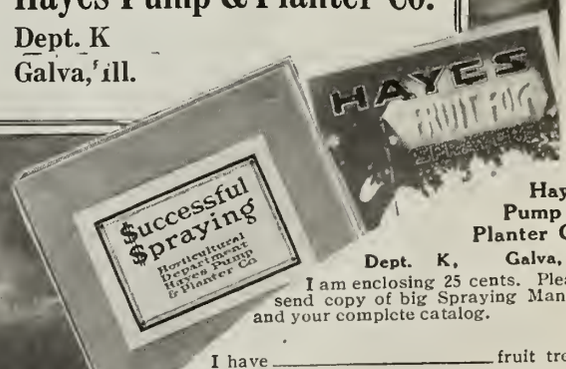

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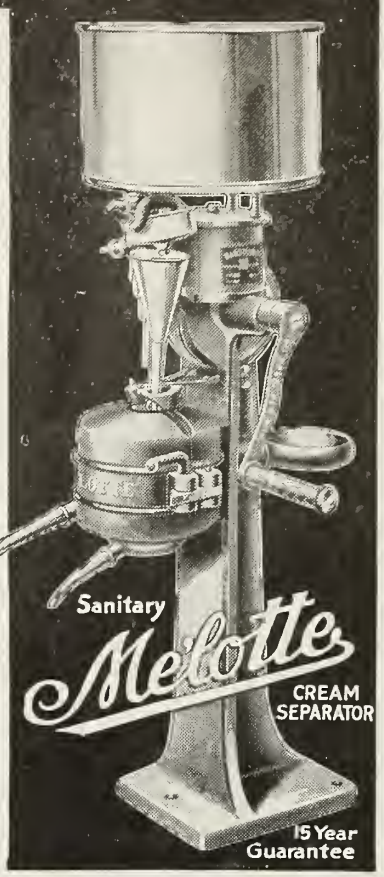

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New Policy of Dealing with Disabled Soldiers

By Douglas C. McMurtrie, Director Red Cross Institute for Crippled and Disabled Men, 23rd Street and Fourth Avenue, New York City

IN the past, our method of dealing with the men permanently disabled in the course of employment has been to pay the worker a pension in the form of compensation, and forget him and his injury. But the cost of disability to the fruit industry has not been alone in premiums paid for casualty insurance. There has been the cost involved in training experience, and the adaptation of a skilled worker who does not return to his job, and the fitting of a newcomer to take his place.

There are three means of reducing and approaching the complete elimination of the cost of disability: first, accident prevention; second, thorough medical attention to minimize the disability resulting from the injury, and, third, salvage of the remaining abilities of the worker through the rehabilitation for self-support. The first of these has already received wide attention from employers and has wisely been encouraged in a financial way by casualty insurance companies and state funds. The values of the two latter have, however, not as yet been appreciated. Their energetic application would effect a tremendous saving to industry.

Many injuries from which men would completely recover in a short time under adequate and high-grade medical attention are treated for an insufficient time, or by incompetent physicians and, instead of a prompt return to work, the case at best drags along over an extended period and at worst becomes chronic or develops into permanent disability. Some states require the insurance carrier to provide but two weeks of compulsory free medical attention to the injured man. For the insurance company to take advantage of this limitation is the most short-sighted policy possible, because for every dollar saved in physicians' or hospital fees, the insurance carrier pays out later ten dollars in compensation. And what the insurance company pays is actually paid by the insuring employers in their regular premiums.

Unlimited medical attention of the highest grade should be an axiom of casualty practice. It should be insisted upon by employer and workman alike. The best outcome of any injury is to have the employe return to his job as a well man in the shortest possible time. It is well to develop a science of dealing with cripples, but the ideal is to have fewer and fewer cripples with which to deal.

The third method of attack on the cost of disability is rehabilitation for self-support—the re-education of an injured man for an occupation which he can follow, or a process which he can perform, in spite of his handicap. The science of rehabilitation is new, and the experience in it has practically all been gained in the effort to make sound and just provision for the disabled soldier or sailor. Every country among the recent belligerents is today operating a comprehensive system of re-education for disabled soldiers, and is placing upon that system more dependence than upon the pension system.

Paying a man a small monthly or weekly stipend on which he is expected to live in idleness is not a very constructive method. With the breakdown of confidence in the pension system, it was realized that the only real compensation for disablement was restoration of capacity for self-support. It was further realized that very few jobs require all the physical faculties and that in the present-day variety of industrial processes, it is possible to find a job in which a man with a given type of disability can function 100 per cent efficient. Some jobs are standing, some seated, others require walking about, some jobs at a bench working on small articles require but little strength, others involve great physical exertion. Still others do not require the sense of hearing, in others the sense of sight is not essential. Finding the future work of the disabled man, therefore, requires expert and painstaking choice, but a successful selection is possible even for the seriously handicapped. The first aim is to place the man back in a different job in his own trade or in a trade closely related. In such a job his past experience will stand him in good stead. Failing this, he can be retrained for a different line.

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TOPPENISH, WASHINGTON

The process of retraining the disabled is known as re-education, and can best be provided in a special school for crippled men. The first school of this kind in the United States is the Red Cross Institute for Crippled and Disabled Men, established in New York City through the generosity of Jeremiah Milbank. At this school, open to disabled civilians and soldiers alike, six trades are already being taught: artificial limb making, motion picture operating, oxy-acetylene welding, printing, jewelry work and mechanical drafting. More will be added as the demand develops. Graduates are already giving satisfaction in the jobs to which they have been graduated, so the enterprise has passed the experimental stage. And in the results attained with disabled soldiers abroad there is overwhelming evidence of the logic and practicality of rehabilitation.

The cost of soldier rehabilitation is being met by the United States government and by the governments of some of our allies. It will be admitted without argument as desirable that the advantages of re-education be made available to disabled civilians as well, but will not the cost be prohibitive? The fact is that rehabilitation effects a reduction rather than an increase in the cost of disability to industry or to the community as a whole.

A typical case will illustrate how the saving is effected. A worker in Massachusetts was injured by a fall while working inside a submarine and his hand became permanently crippled. In due course his compensation rate was determined and he was referred to the insurance carrier to be paid ten dollars a week for a long period, with a maximum total payment of four thousand dollars. Since the disability was manifestly permanent the insurance company wrote the case off their books as a four-thousand-dollar loss and transferred that amount to reserve to cover the weekly payments. After the compensation had been paid for nearly a year, a new official of the insurance company began looking over the list of men to whom the company was paying compensation. His attention was directed to the man in question and the latter was requested to call at the office of the company. The case was, like many thousands of others, susceptible of rehabilitation for self-support, so the insurance company official put a proposition to the man in very frank terms. "I believe that you can be trained to earn a good living. I want you to understand very clearly, however, that this proposal is to the financial advantage of the company, but I also believe it is to your advantage as well. A total income of ten dollars a week is not very attractive to you and you would probably rather return to work at a good wage than remain idle. If you will consent, the company will send you to a school of re-education and see if we cannot get you back on your feet in good shape."

The injured man consented to the proposal and the company sent him to the Red Cross Institute in New York. They began to pay him, not ten dollars a week as required by law, but forty dollars a week, twenty to him in New York and twenty to his wife at home. The company also paid liberally his traveling expenses in both directions. In the period of eight weeks he was re-educated in oxy-acetylene cutting and welding and returned home. He is now making not only a satisfactory wage but twice as much as he had ever earned before the accident took place.

In the whole transaction every party at interest was benefited. The man was advantaged in that his general living standard was distinctly raised, and the necessity of working for his living could not be considered as a hardship. The company paid less than five hundred dollars for his rehabilitation, and this expense, in conjunction with the five hundred dollars already paid in weekly compensation during the first year of idleness, made a total for the case of one thousand dollars. They were thus enabled to charge three thousand dollars of profit to the account of profit and loss. The community was infinitely the gainer in that the man, formerly an unproductive consumer, became a useful producer instead. The community further gained in the elimination of the disabled man from the category of a prospective dependent, because while compensation might have taken care of him in a very insufficient way during the period of idleness, there would have come a time when compensation ceased, and then he would have been in a desperate economic status indeed—confirmed in habits of idleness, untrained for skilled work, and without any source of support.

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A more intelligent handling of disability by insurance carriers will, therefore, reduce their expense, and will thus cut the cost of casualty protection to the employer. There is needed also, however, some revision of compensation laws so that there may be definite encouragement to insurance carriers to offer opportunity of rehabilitation and definite encouragement to the disabled men to take advantage of it. Practically every compensation case that has ever come to the Red Cross Institute has come on the day his compensation expired. For one year, for two years, or for four years the man has existed in idleness, drawing compensation and cultivating habits of indolence. When his support was cut off, he then became interested in rehabilitation. Present compensation legislation tends to encourage the man to remain idle because his payments are reduced by any improvement in earning capacity. A revision of this practice will make for more constructive provision.

In short, the first effort should be to prevent injury, the second to minimize its permanent effects, the third—when disability has ensued—to offset its economic consequences. The execution of this complete program is not only sound humanitarian practice—it is good business as well.

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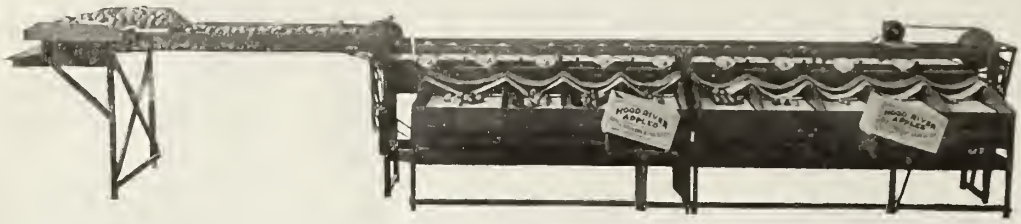

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Hood River Strawberry Fertilizer Tests

By Gordon G. Brown, Horticulturist, Hood River Experiment Station

DURING the seasons 1916 to 1918, inclusive, the Hood River Experiment Station has conducted a series of fertilizer tests with strawberries upon the so-called Red Shot Soil at Dee. This is the character of soil predominating throughout all that portion known as the Upper Valley. Since a very large percentage of the strawberry acreage of the valley is made up of this type of soil and much further development of the industry will be made under similar soil conditions the importance of first-hand information regarding its fertilizer requirements is apparent. Although it is recognized that there are several different soil types in the valley upon which this crop is growing and that results from these specific tests may not apply in all cases it is believed they will serve as a reliable guide which the grower may safely follow.

This soil has proved its splendid adaptability for small fruits, especially the strawberry. Plants make large and vigorous growth when given good care. Its natural tilth is excellent and perfect drainage is afforded. Its water-holding capacity is fair. Most of the acreage upon which this crop is growing has recently been cleared of brush and stumps. It was formerly covered with a dense forest of excellent timber. In most cases growers have used clover for green manurial purposes before growing other crops. Evidence is abundant that the practice has been a wise one in that yields of all crops, especially the strawberry, have been increased thereby. The prevailing practice is to grow strawberries between orchard trees. The use of commercial fertilizers has assumed considerable proportions, but the practice is unstandardized in that many different kinds are being used, some with good and others with indifferent success. However, this is a fact remarkably true for the United States as a whole, practices varying widely.

I have prepared a chart which shows graphically the plan of these experiments and results secured. For these experiments plants bearing their first crop in 1916 were chosen. They were vigorous and uniform in size. In both patches clover was turned under before the plants were set. No other fertilization was afforded these until the experiment started. The aim was to find out: Under these conditions may increased yields be secured by the use of a mineral fertilizer carrying the limiting elements, nitrogen, phosphoric acid and potash, alone or in combination. Keeping in mind that shipping quality is very important, since the Clark Seedling is often marked at a great distance, can we by such means increase size of berries consistent with the necessary firmness and keeping quality? What influence has such fertilization upon the productive life of the plants and incidentally upon vigor? The grower will appreciate any increase in yields since this factor is undoubtedly the limiting factor under local conditions. The variety is naturally a shy bearer and often, due to lack of proper management, yields are so small as to make the industry unprofitable. Undoubtedly the fact that it possesses first-class quality, especially that of shipping long distances, has prevented its being replaced by some other variety given to greater yields.

Unfortunately we are unable to answer the question advanced relative to the number of years during which the plants may by such fertilization be expected to bear profitably. The ravages of the Root Weevil (Anthonomus signatus) became so severe at the end of the third season that it became necessary to plow up both patches, as was also true of other experiments well under way but not herein reported upon.

For these tests, nitrate of soda carrying 16 per cent nitrogen, superphosphate testing 19 per cent phosphoric acid and sulphate of potash containing 50 per cent potash were used. First

applications were made in early spring just as the plant was starting growth, and later applications were made just as the blossoms were opening. When nitrate was used alone, a total of 220 or 440 pounds per ten thousand plants formed a basis of the applications. These amounts were either applied at one time or equally divided, one-half being put on in early spring and the remainder when blossoms appeared. Thus, as will be seen by the chart, we are able to compare results on the basis of time applied and amounts used. Plat 6, in both tests, was left unfertilized and will hereafter be referred to as the Check. Nitrate, when combined with superphosphate or sulphate of potash, was used at the rate of 220 pounds per ten thousand plants, while superphosphate or sulphate of potash, whether used alone or in combination, were used at the rate of 470 and 125 pounds respectively. As will be noted from the chart, all combinations possible for these fertilizers were made. All fertilized plats other than those in which nitrate was used, received one application in early spring and none at blossom time. These tests represent three successive annual applications.

These tests were based on applications before the harvest season, since it is the common conception that demands for available fertility are greatest at that time. Professor S. W. Fletcher of the Pennsylvania State College, in his text-book on "Strawberry Growing," is quoted as follows: "Although the amount of plant food actually removed by the strawberry plant is small, the crop responds to liberal fertilizing. This is partly because it has a high money value an acre—prospective, at least,—but chiefly because of the very short time between the blossom and the ripe fruit. In the North, the plants have only about four weeks in which to develop a crop that may weigh three or four times more than the plants. The apple has several months in which to mature its fruit, a large crop of which is not nearly equal to the weight of the trees. Hence, the main fertilizer requirement of the strawberry is that the plant food shall be immediately available." Furthermore, owing to the very open structure of the soil on which these experimental plants were growing and the extreme solubility of nitrate it was feared that a considerable portion of that applied in early spring might be leached away before it was fully utilized by the plant, hence on some plats two equal applications of the total amount indicated were made.

Yield.—As will be noted, yields for 1916 on an average far surpass those of either 1917 or 1918. The great differences in yields shown were due probably more to seasonal changes than to age of plant. The winter of 1915-1916 was quite favorable. Snow covered the plants throughout the dormant season when low temperatures prevailed. The picking season of 1916, although unfavorable for harvesting on account of the excessive rainfall, was nevertheless long and comparatively cool, allowing the fruit to ripen slowly and uniformly. On the other hand, the winters of 1917 and 1918 were not so favorable, since during considerable portions of the dormant season, snow, nature's mulch, was absent and the plants were subjected to heaving and thawing together with drying winds. Frost injury during the blossoming seasons was also a contributing factor. Furthermore, the harvesting seasons of 1917 and 1918 were short and hot, resulting in rapid ripening and decreased yields.

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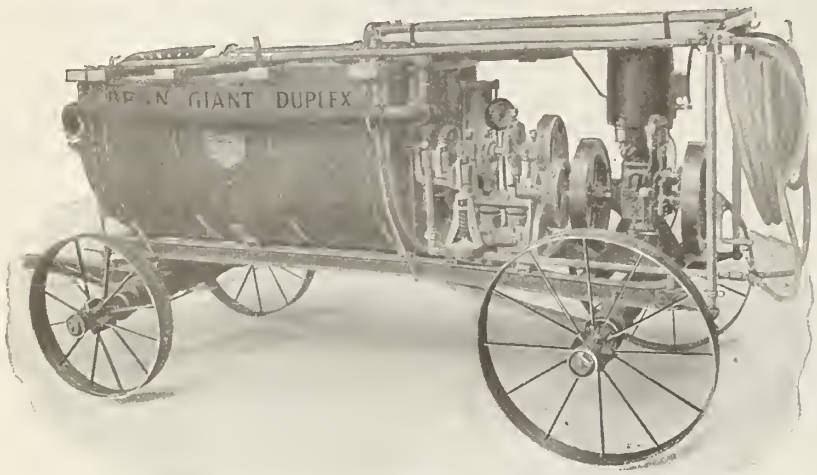

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That yields have been materially increased by the use of fertilizer is clearly indicated. First, compare results from plats receiving nitrate alone in different amounts and applied at different times. We are chiefly interested in average yields on a three-year basis and it is to this column to which your attention is directed. Yields are computed on a heaped basis just as brought from the field, which is equivalent to a packed crate. It seems best to compare results for both tests at one time. It will be seen that plats representing a total of 440 pounds nitrate to the ten thousand plants, one-half of which was put on in early spring just as growth was starting and the balance when blossoms appeared, gave highest yields. In Test 1, 281 crates have been secured versus 230 for the Check, or a gain of 51 crates per acre. The yield for the check is unusually good and probably doubles the average for the valley. The significance of increased yields by the use of commercial fertilizer under such conditions is interesting indeed. This high average is made possible by the exceptionally high yield for 1916, that of 373 crates, a truly remarkable record considering that no fertilizer was applied. Results from similar applications in Test 2 are consistent with those in Test 1. Plat 3 shows an average total of 250 crates per 10,000 plants versus 188 for the Check, or an increase of 62 crates, or 35 per cent.

In Test 2 only, an opportunity is afforded to note average results from the use of one (heavy) 440-pound application of nitrate put on in early spring only. It shows a very high average for three years, or 244 crates per acre.

A further study reveals the fact that a total of 220 pounds nitrate put on in two installments, although considerably surpassed by the heavier applications (Plats 4 and 5) in Test 2, is only very slightly exceeded in Test 1. The figures on a three-year average show 277 crates for the former (Plat 3) versus 281 for the latter (Plat 5). Furthermore, it will be noted that a total application of 220 pounds nitrate put on in two installments (Tests 1 and 2, Plat 3) give yields exceeding that from plats receiving a similar amount put on at blossoming time (Test 1, Plat 2), or from plants receiving a similar total amount put on during early spring only (Tests 1 and 2, Plat 1). The advantage of putting on nitrate in equal installments, whether in larger or smaller amounts, is indicated. That heavier applications give larger yields than smaller applications is also clear.

Results from the use of sulphate of potash or superphosphate alone are disappointing. In Tests 1 and 2 the former gives yields on an average lower than that of the Checks. This is also true for the latter in Test 1, while the slight increase in Test 2 is negligible.

When a "Complete Fertilizer" was used, as shown in Plat 7, increased yields have been secured. Results in this respect are consistent in both tests. The increases, however, are considerably below that given for heavier applications of nitrate. It is also noteworthy that nitrate when combined with superphosphate in the proportions indicated show smaller yields than the Checks, but when combined with sulphate of potash increased yields are afforded. Results from the combination of potash and superphosphate are such as to afford little clear-cut evidence. In Test 1 results are satisfactory in that considerable increase is shown, but a reverse is found in Test 2 (Plat 8).

Owing to the fact that it is hoped to place in your hands soon a bulletin covering this experiment I will not refer to the matter of size of fruit. Complete information in regard to this matter will be summarized therein.

Summer Applications versus Spring Applications.

During the last two seasons experiments have been conducted to determine the value of applications made shortly after the harvesting season as compared with similar applications at blossoming time. Unfortunately, owing to the ravages of the Root Weevil the two experiments being conducted with plants still in their prime had to be discontinued after only one season's

Continued on page 33.

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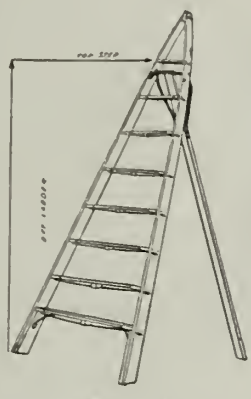
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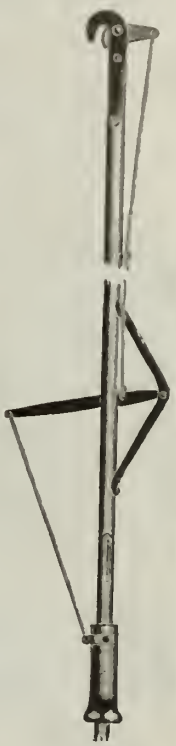
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Correlation of Orchard Practices

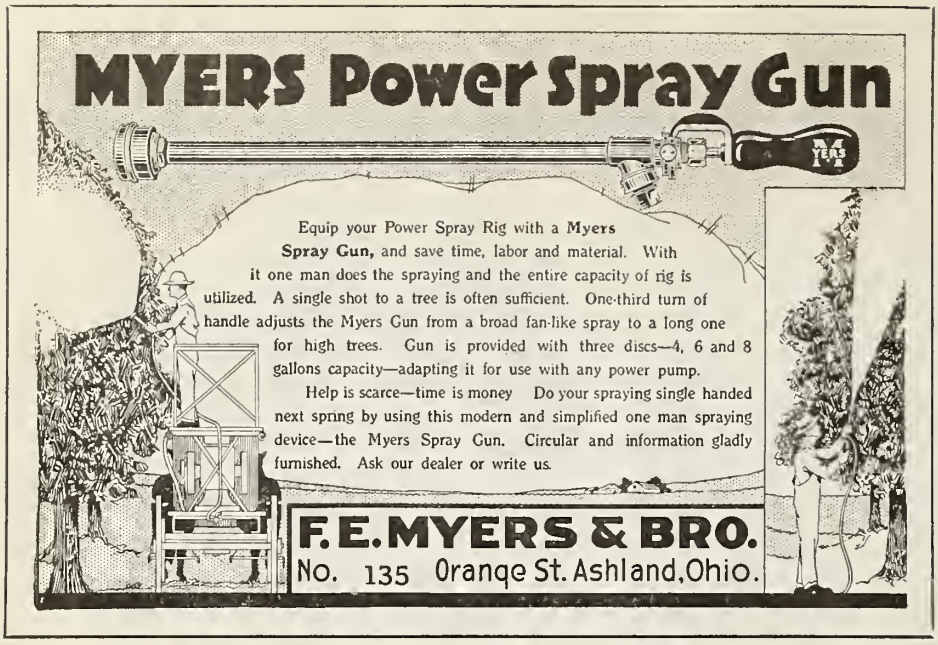
By C. I. Lewis, Chief, Division of Horticulture, Oregon Agricultural College

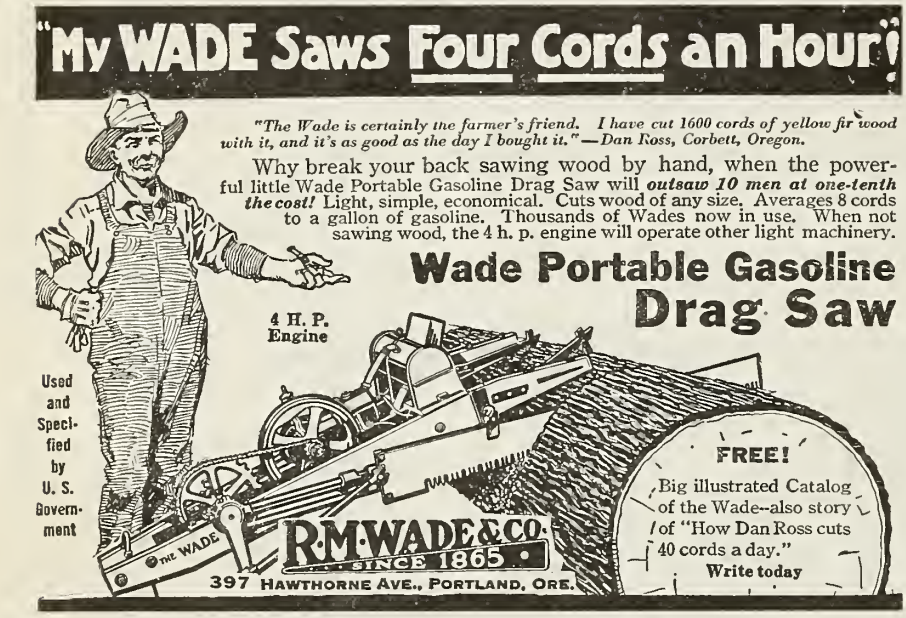
THERE is no question of greater importance to the orchardist than that of the proper vigor of his trees. The question of vigor is really a relative one. The type of vigor in very young trees might not be the same type desired in a mature tree. During the first few years of a tree's life it growes very vigorously and makes a very rapid vegetative growth; later it ceases the extremely vigorous wood growth and begins to bear fruit. It finally reaches very heavy bearing and gradually goes into a decline or reaches a state of equilibrium, so to speak. We can see in a general way that a tree adapts itself to its surroundings or environment, and as a result is either in a state of equilibrium with the environmental forces or is undoubtedly becoming adjusted to its surroundings. We also remember how neglected trees by the roadside soon reach a condition when they do not change very materially. They do not make much new growth, neither do they change their bearing habits very materially.

In discussing the question of vigor, I wish to divide the trees into three classes. The first will include trees from about one to five years of age. These trees are in what we might call the formative period; second, those trees from five to eight years of age, or in some cases somewhat older, are passing from the formative stage or body-building condition into the fruiting stage. We sometimes call this the transition or critical period. The third class of trees include those which have reached heavy bearing, trees eight to ten years of age and older.

We will discuss first the trees in the formative period. During this time we desire trees which are sturdy and stocky, trees which are growing well. To encourage this condition we should give very intensive tillage, beginning as early in the spring as the ground can be conveniently worked, and following this with frequent stirrings of the ground until about the middle of July, or until such time as the trees have made a desirable terminal growth. As soon as this period is reached it is well to cease tillage and encourage the trees to harden for the winter, giving them an opportunity to thicken their growth rather than encouraging more terminal growth. We can make two classes of food which the tree receives. The first is the raw sap or mineral food; soil nutrients largely nitrates, so to speak, which come up from the roots into the leaves, and, second, the elaborated food which is manufactured by the leaves themselves. The leaves receiving the raw food from the roots combine it with certain gases obtained from the air, manufacturing in this way concentrated foods or carbohydrates, sugars and starches, so to speak. In the early spring when there is a large amount of sap coming from the roots, the leaf area of the tree is small, and it is noted that the tendency of the tree is to make a pronounced shoot growth. Any stimulation given to the tree at this time tends to produce additional shoot growth. Later, if the leaves have fully expanded and the sap supply is somewhat reduced, the elaborated food manufactured in the leaves becomes relatively more abundant. The trees now tend to increase the diameter of the branches and store food, showing less tendency to make terminal growth than formerly. Should it be desired to intercrop young orchards, tilled or hoed crops are superior since their tillage also assists the trees. Strawberries and early-garden truck are among the most desirable crops to grow. While grain and hay occasionally may be grown, if they come very close to the trees they will retard the growth and may seriously stunt the trees. Under normal conditions very little soil fertilization should be required for young trees. If, however, such trees are puney and not growing as desired, it may be necessary to stimulate them by artificial means.

In pruning such young trees there are several points we wish to keep thoroughly in mind. First, the trees should





be so headed as to give a good spacing of branches and thus avoid weak crotches. Second, the main branches of the trees should be kept at about equal vigor. This is done by cutting back and reducing the leaf area on the more vigorous branches, thus giving the weaker branches a larger proportion of the food. Third, we should constantly try to avoid weak forks. This is brought about by avoiding equal cutting, and where two branches form a union we should rather cut so that one branch is longer than the other. The shortened branch thus becomes a lateral of the longer branch and one avoids in this way the weak U or V-shaped crotches which otherwise will become very prevalent.

During the first three years of a tree's life, pruning is especially valuable in determining the type and direction of growth. By proper heading and thinning, laterals are forced out at desired points and a strong framework is built up for future years. By the time the trees are three years of age a certain amount of summer pruning may be given to advantage. This pruning normally should come from about the middle of June up to the middle of July, or at such a time when the branches have made a desirable terminal growth. Light heading at this time does not remove very much wood but causes the tree to throw out laterals, thus giving us the opportunity of gaining a whole year in the formation of certain laterals. This type of pruning likewise encourages the formation of fruit spurs on the older portions of the tree. Thus we will not only gain time in the body building but we will also encourage an earlier fruiting of the tree.

By the time trees have reached the second period, that is, the transition or critical period, we should have a sturdy tree, well balanced and capable of bearing fruit. Our method of handling the tree as regards pruning, fertilizing, tillage, irrigation, etc., should be to encourage the formation of a thick, sturdy growth. We desire branches capable of storing food rather than much terminal growth, which is generally not rich in such foods. We should allow the trees to accumulate the carbohydrates, as an accumulation of such food is necessary to encourage the formation of fruit buds and spurs. Anything which is done with the tree at this time to encourage the accumulation of carbohydrates will simply delay the period of fruiting. Where trees are extremely vigorous it will be well to check them. This can be done by reducing the tillage, or even in some cases by ceasing tillage entirely, or even by the growing of a cereal crop for a year.

Moderate thinning is generally the best type of pruning to follow. Heavy heading should by all means be avoided, and even heavy thinning, as such practices remove too much stored food which the tree now needs. In fact if the trees are not headed at all for a year or two at this period, the results may be very gratifying. Such a practice, however, should not be carried

over too long a period. Should it be absolutely necessary to remove some of the terminal growth, this might be done to advantage at about the time the trees have made a desirable terminal growth, which would be by the middle of June. Trees during this period that are very vigorous and which bear a small amount of fruit, generally produce overgrown specimens, poorly colored, and very subject to fruit pit.

When our trees have reached the third period, namely, that of heavy bearing, we must again study the interrelation of pruning, tillage, fertilizing and intercropping and the influence of such practices on the vigor of the tree. The production of regular heavy crops of fruit is a drain on the tree and one which we must constantly meet. We again begin to follow more intensive tillage as we did during the first period. Early-spring plowing, thorough harrowing and frequent stirring of the ground should be practiced so that abundant moisture should be maintained until harvest time in the fall. Under irrigated conditions we could to advantage sow the orchard to alfalfa or clover and irrigate thoroughly. If our trees suffer for want of moisture, however, we will note certain undesirable characteristics. The fruit tends to be flat and smooth and the color dull and unattractive, the wood, foliage, buds and spurs show signs of devitalization and the trees begin to set poorly and mature small crops of inferior fruit. Where there is an abundance of moisture the color is bright and attractive; the fruit tends to become oblong in form, is large in size, leaves and fruit show signs of good vigor and the culls are materially reduced in quantity. There is less cracking around the stem and calyx and less premature dropping of fruit.

Plenty of plant food at this time is also very essential, the element which seems to be lacking especially on the lighter soils is nitrogen. The restoration of nitrogen to the soil often produces marvelous results in a relatively short time. While we may add nitrogen to the soil in various ways, one of the quickest ways is to add it in the form of a highly-concentrated salt such as nitrate of soda. To get the best results, however, such application should be made at least a month before the trees bloom.

TABLE No. 1—INFLUENCE OF DATE OF APPLICATION OF NITRATE OF SODA ON PER CENT OF FRUIT SET

Variety	*Date Applied*	*Pct. of Set*
Newtown	March 6	50.1
Newtown	March 20	46.4
Newtown	April 4	42.5
Newtown	April 18	No record
Newtown	May 7	32.2
Spitzenberg	March 6	43.6
Spitzenberg	March 20	46.9
Spitzenberg	April 4	34.1
Spitzenberg	April 18	33.6
Spitzenberg	May 7	21.2

Early fertilized Newtowns averaged 7.9 boxes; late fertilized Newtowns averaged 2.28 boxes; early fertilized Spitzenbergs averaged 10.83 boxes; late fertilized Spitzenbergs averaged 1.20 boxes.

TABLE No. 2.

Plat No.	Pounds Per Tree 1914	Pounds Per Tree 1915	Treatment 1916	Yields, Loose Boxes 1914	Yields, Loose Boxes 1915	Yields, Loose Boxes 1916	Yields, Loose Boxes Average	Terminal Growth Inches Average 1914-15	Terminal Growth Inches 1916
Orchard No. 1									
1a	5.2	5.2	Clover green manure	4.1	8.1	13.	8.4	15.2	20.1
2b	5.2	5.2	Clover green manure	.1	8.5	14.8	7.8	11.4	17.1
3c	5.2	5.2	Clover green manure	.2	6.00	9.6	5.3	13.9	16.1
4	No fertilizer		.....	.2	.31	8.8	3.1	6.9	19.9
Orchard No. 2									
1a	6.75	6.75	Alfalfa sod	1.9	10.0	14.8	8.8	8.4	15.4
2b	6.75	6.75	Alfalfa sod	2.3	9.9	15.5	9.2	10.3	8.4
3c	6.75	6.75	Alfalfa sod	9.8	10.1	15.7	11.8	10.9	14.7
4	No fertilizer either year.....			2.1	.9	5.7	2.9	6.6	5.2

(a) Fertilizer broadcast on ground; (b) Fertilizer sprayed on ground as liquid; (c) Fertilizer sprayed on ground and tree as liquid.

Except during the first year, nothing is seemingly gained by placing the nitrogen in liquid form on the ground or spraying it on the trees. The reason for the results the first year is that we had a very dry spring, the dry nitrate was added rather late, and thus the nitrate spread broadbcast did not get into solution in time to be of benefit to the trees during the blooming period.

TABLE No. 3—FIVE-YEAR SUMMARY, YIELDS AND VIGOR GROWTH, ORCHARDS 1 AND 2. SPITZENBURGS.

Orchard No. 1	Pounds Nitrate Per Tree *Plat 1*	2	3	4	Yields per Tree Loose Boxes *Plat 1*	2	3	4	Terminal Growth, Inches Annual Average *Plat 1*	2	3	4
1914.....	5.2	5.2	Check	5.2	4.1	.2	.2	.1	12.8	10.8	7.5	9.25
1915.....	5.2	5.2	none	5.2	8.1	6.0	.3	14.8	18.0	17.0	6.4	13.6
1916.....	...	...	"	...	13.0	9.6	8.8	14.8	20.1	16.1	19.9	17.1
1917.....	...	...	"	...	18.7	18.6	15.3	17.3	13.3	14.0	18.1	10.6
1918.....	3.0	*3.0	"	...	5.7	2.6	1.1	4.0	17.6	13.2	13.2	14.6
Average	...	...	"	...	9.93	7.4	5.1	8.9	16.3	14.2	13.0	13.07
Orchard No. 2												
1914.....	6.7	6.7	"	6.7	9.8	1.6	2.1	2.3	7.8	5.8	5.3	4.5
1915.....	6.7	6.7	"	6.7	10.1	10.0	.9	9.9	14.0	11.0	8.0	16.2
1916.....	...	...	"	...	15.7	14.8	5.7	15.5	14.7	15.4	5.2	8.4
1917.....	...	...	"	...	4.5	2.8	3.9	3.3	11.1	11.2	12.1	10.7
1918.....	3.0	3.0	"	...	6.66	6.8	5.5	5.0	12.5	10.6	10.3	13.5
Average	...	...	"	...	9.38	7.21	3.6	7.2	12.03	10.3	8.1	10.6

Table 3 gives a summary of the yields and growth of two orchards in the Hood River Valley over a five-year period. A continuation of the study of the orchards described in Table 2.

TABLE 4—PER CENT OF SET AND SIZE OF FRUIT INFLUENCED BY NITROGEN HOOD RIVER EXPERIMENT STATION.

Plat	Pounds Per Tree	Fruit Set June 4	Per Cent September 30	Size of Fruit *175-150	Size of Fruit *138-112	Per Cent 100 and Larger
1.....	6.7a	82.6	34.6	8.28	24.71	68.10
2.....	6.7b	68.0	30.7	22.64	29.13	48.23
3.....	6.7c	69.6	37.3	24.61	41.87	24.61
4.....	.0	35.3	16.4	76.24	18.32	5.43
Fertilized averages		73.4	34.2	18.5	31.9	46.9
Difference		38.1+	17.8+	57.74−	13.58+	41.47+

*Note—Figures 175 to 150 and 138 to 112 refer to the number of apples to the box.

TABLE 5.

Spitzenbergs— Plat No.	Pounds Fertilizer Per Tree	Terminal Growth Inches	Leaf Growth (Inches) Length	Leaf Growth (Inches) Width	Yields Per Tree Loose Boxes	Increase Per Cent
1.....	7.3	11.7	2.95	1.79	16.1	87
2.....	5.00	9.9	2.92	1.90	13.44	56
3.....	...	4.1	1.99	1.35	8.56	..
4.....	3.00	14.1	2.90	1.85	12.61	47
Newtowns—						
1.....	7.3	9.5	2.93	1.92	14.1	166
2.....	5.00	6.2	2.79	1.82	11.9	124
3.....	...	4.5	2.32	1.48	5.3	..
4.....	3.00	6.4	2.75	1.93	9.5	79

During the past two years we have conducted additional work in both the Hood River and Rogue River Valleys. The following tables show the results of our experiments for the seasons 1916, 1917 and 1918. In Table 6 we give two orchards in Hood River Valley.

TABLE 6—YIELDS PER TREE AND VIGOR OF GROWTH.

Plat No.	Pounds Nitrate Per Tree 1916	1917	1918	Total	Yields Per Tree Loose Boxes 1916	1917	1918	Average	Terminal Growth (Inches) 1916	1917	1918	Average
Spitzenbergs—Orchard 3												
1A.....	7.3	7.3	..	14.6	18.0	9.8	10.0	12.6	11.5	14.4	15.7	13.8
1B.....	7.3	..	7.3	14.6	14.2	4.37	7.0	8.5	11.5	10.8	14.9	12.4
2A.....	5.0	..	5.0	10.0	13.9	2.4	6.6	7.6	9.9	7.6	15.1	10.9
2B.....	5.0	5.0	..	10.0	13.2	5.8	10.6	9.9	9.9	13.7	11.2	11.6
3	Check	None	..	..	8.5	1.2	9.8	6.5	4.1	6.9	12.0	7.7
4A.....	3.0	..	3.0	6.0	16.0	1.23	13.5	10.2	14.1	7.9	10.5	10.8
4B.....	3.0	3.0	..	6.0	10.4	2.9	12.0	8.4	14.1	13.9	7.43	11.8
Newtowns—Orchard 3												
1A.....	7.3	7.3	..	14.6	14.6	9.7	16.1	11.4	9.5	7.35	15.0	10.6
1B.....	7.3	..	7.3	14.6	13.1	7.3	6.7	8.8	9.5	5.6	10.9	8.7
2A.....	5.0	..	5.0	10.0	12.8	5.8	7.2	8.6	6.2	7.3	15.0	9.5
2B.....	5.0	5.0	..	10.0	11.4	12.7	5.0	9.7	6.2	9.6	12.2	9.3
3	Check	None	..	..	5.3	5.7	7.3	6.1	4.5	3.8	15.2	7.8
4A.....	3.0	..	3.0	6.0	12.7	4.9	14.6	10.7	6.4	3.1	8.1	5.88
4B.....	3.0	3.0	..	6.0	7.5	11.3	6.1	8.3	6.4	9.05	7.0	7.48

Note—It is to be noted that the letters A and B mean that after the season of 1916 each plot was divided into two plantings, each receiving nitrate alternately.

Rogue River Experiments.

TABLE No. 7—FERTILIZERS APPLIED 1917. Spitzenburg Apples.

Fertilizers applied	*Pounds Per Tree*	*Boxes Per Tree*
Sulphate of ammonia.....	5	5.93
Nitrate of soda.....	5	7.60
Nitrate of soda.....	5	8.73
Superphosphate	5	....
Check	..	1.33
Dried blood	6½	3.35

One can readily see that the trees are revitalized, so to speak, very rapidly, and the influence is shown in the blossoms, percentages of set and also in the attractiveness of blossoms, the nitrate making them more showy and attractive. The influence is also shown in the percentage of yields, in the size

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of fruit and in the color. As regards color, however, we would warn against the excessive use of this fertilizer. From three to five pounds, under our conditions, has been ample, and while greater yields can be obtained from seven to ten pounds, the color is so greatly reduced as to be often undesirable.

TABLE No. 8—FERTILIZERS APPLIED 1916.
Spitzenburg Apples.

Fertilizers applied	*Pounds Per Tree*	*Boxes Per Tree*
Nitrate of soda	10	21.7
Check	..	4.1
Superphosphate	10	2.5
Muriate of potash	8	4.3

Here the yield one year after application is greatly increased; too much so, since the color is poor.

Under irrigated conditions we have advised the growers to add nitrate of soda where the trees are showing signs of being run down, but to immediately plant alfalfa, clovers or similar crops in the orchard and irrigate them thoroughly. After two years, under most conditions, such crops will furnish the desired nitrogen to the trees. With some varieties, however, continued application of the nitrate will pay.

Under non-irrigated conditions, we are supplanting the use of nitrates by using cover crops. The following conclusion on our nitrate studies in Oregon are of interest:

An application of five pounds of nitrate of soda will quickly restore devitalized trees.

The benefits of nitrate applications are shown in dark green foliage.

Better wood growth.

More attractive blossoms and a much better set.

Nitrated trees utilize available bloom better.

A tendency to bloom more regularly, nitrate tending to regulate bloom in that it is better distributed from year to year.

Greatly increased yields.

Large specimens.

Color of red varieties receiving nitrate on the whole not as good as checks, but of good commercial color unless excessive amounts of nitrate are used.

The response is in proportion to the amount of fertilizer used, three to five pounds under normal conditions being more satisfactory than larger amounts.

The influence of nitrate is more marked in the years when trees would naturally have big crops and not during light years.

When trees have been restored to vigor by two successive annual applications of nitrate followed by the use of clover or alfalfa as green manure, yields during two or three years subsequently have not greatly differed from that of trees receiving only the influence of the cover crop. This was especially true for Newtowns, but not so much so for Spitzenberg.

The benefits from the use of nitrate extend over two seasons.

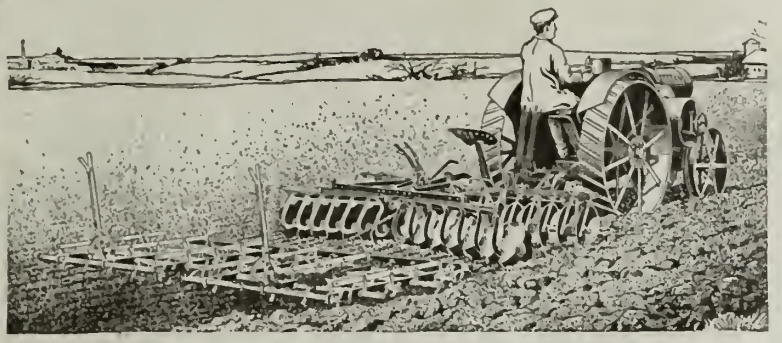
The greatest benefit comes when applied to devitalized trees under clean tillage conditions.

Where plenty of moisture occurs in soil, spread the fertilizer on broadcast; under dry conditions either apply as a liquid or spray on the trees. Such spray may be combined with lime and sulphur.

To get best results, nitrate should be applied about a month before the trees bloom.

In a general way I would wish to say that the pruning of such trees should be regular, should be moderate and well distributed throughout the trees. We should tend generally to avoid excessive heading or excessive thinning unless trees have entered such a decline that it has become absolutely necessary to build large quantities of new wood.

For the past twelve years we have been conducting at the Oregon Experiment Station research studies on the subject of fruit pollination. Results of these researches have been published from time to time in various station bulletins. We have determined the sterile and fertile varieties and the possibility of inter-pollination. We soon realized that such studies were insufficient. We then made a detailed study of the morphology of the fruit. This in turn made it necessary to carry our studies into new fields. The results of our nitrate work in Hood River and elsewhere led us to believe that there was a correlation between the feeding of the trees and the setting of fruit. Accordingly Dr. E. J. Kraus decided to spend a couple of years at Chicago and together with Dr. H. R. Kraybill of the Agricultural Chemistry Department of the Pennsylvania State College, studied the influence of nutrition on the setting of fruit. In order that they could secure frequent crops, they chose the tomato, which would give them six crops in a season when grown under greenhouse conditions, the results of which have been published in Bulletin



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Other useful implements in this line, each built for its own special work, are open end, closed end, and flexible peg-tooth harrows, spring-tooth harrows with single and double end teeth, and one-horse cultivators with every kind of tooth and shovel equipment. These, too, can be seen at the local dealer's place of business, or we will send catalogues on request.

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149, "Vegetation and Reproduction with Special Reference to the Tomato." They tried the influence of various nitrates on plant development and soon found that they could divide plants into a number of groups, among which were, first, those plants which seemed to be extremely vigorous rarely bloomed and, if they did at all, set but few fruits; second, plants which made a very fair growth seemed to be in good vigor, bore very abundantly, producing a large number of clusters of blossoms which readily set fruit. The third set of plants were less vigorous than the second, pruned profusely but set sparingly.

A chemical analysis of these plants showed that the first group always contained an abundance of moisture and soil nutrients. The second group contained a decrease in nitrates as compared with the carbohydrates, that is sugars and starches, while the third group contained much less of the

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nitrates and proportionately much more of the carbohydrates. From these studies it was shown that to get the best results, there must be a certain mathematical relationship between the nitrates and carbohydrates.

Let us see how these studies relate to our apple tree. With the first group of trees, those from one to five years of age, we have a great abundance of nitrogen as compared with the carbohydrates; such a condition being encouraged by intensive tillage. Severe heading of trees, etc., which encouraged the flow of raw foods and discouraged the formation and storage of elaborated foods such as sugars and starches. As a result we secured wood growth but not much fruit. In our second group of trees, from five to eight years of age, we find that by reducing the tillage, pruning and other stimulations, that we are automatically reducing the relative proportions of raw sap and nitrogen, allowing the increased leaf area to manufacture more concentrated food such as sugars and starch. As a result, such trees begin to form fruit buds and bear. In the third class of trees, the nitrates become even more reduced in proportion to the carbohydrates. We seemingly reach a happy balance between the two and secure both vegetative growth and plenty of fruit, a very desirable condition to have. As the trees get older, however, the leaves get yellow and thin, the spurs begin to die, the fruit set is poor, and we find the nitrates have been greatly reduced as compared with the carbohydrates, the trees are starving to death for the nitrates, starving amid plenty of sugars and starches, so to speak. This explains how the amount of nitrates added in the spring produces such results; it once more restores the balance between the carbohydrates and the nitrates.

Pruning the Walnut Tree

By Ferd Groner, Hillsboro, Oregon

MANY think that the walnut tree does not need pruning, but this is a mistake. While it does not need as much thinning as do apple and some other fruit trees, it needs to be shaped and pruned to get the best results.

We will start with the tree before it is planted. All the broken and bruised roots should be removed and all the ends of roots should be cut back to good green wood with a sharp knife. This will enable the calous to form better where most of the roots start. If these ends are not cut off the dead and bruised wood seriously interferes with the starting of the rootlets which make the growth and vigor of the tree. Cut off the top at about thirty inches high. The reason for this is that you can seldom start a satisfactory head from the original top. The buds that start out near the ground first are the most vigorous ones. Drive a stake as close to the tree as possible after the buds have started, rubbing them all off but two or three. After they have grown three or four inches take off all but one and train it up the stake, which should be strong enough to hold the tree erect for three or four years.

Do not head the tree back during the growing season unless it is absolutely necessary to keep it from breaking off. If you do, it will throw out a lot of sucker sprouts. These should be cut off as close as possible as they all have a poor union and will almost invariably break or split off. Any shoot that starts from growth of the same season will never make a satisfactory branch and should be removed during the dormant period so new branches will start the next season.

The height a walnut tree should be headed has been a much-argued question. As walnuts are not picked, but fall or are shaken down, I see no need for heading the tree low. They should be high enough so the branches will not interfere with cultivation. Some advocate starting the branches at about three or four feet from the ground and training them upward for two or three feet more before they are allowed to spread. This requires considerable labor in tying the branches in the position desired and keeping them in position for two seasons at least. By heading at from five to six feet the branches can be left to take their natural ten-

Continued on page 25.

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This orchard is in its seventh year and promises to bear very well this season. It is beautifully located on the north bank of the Choptank River, which is a navigable stream one-half mile wide and furnishes a splendid air draft for the orchard. It is located on the state road between Baltimore and Ocean City and within four miles of the town of Easton, and has a railroad station within one and one-half miles. The owner is a man who is past 70 years of age and is desirous of having an active man to take an interest in the farm and manage it, or would sell out entirely. The soil is first class and the neighborhood a pleasant one. This orchard is 95 miles from Philadelphia by rail or auto, 190 miles from New York and 300 miles from Boston.

SETH & SHEHAN
Easton, Md. Attorneys for Owner.

UNIVERSITY OF ILLINOIS.
Urbana, Illinois, July 25, 1918.
Sherwin-Williams Company,
Cleveland, Ohio.

Dear Sir:

In compliance with your request of July 16th I take pleasure in handing you the following statement with reference to the behavior of your Dry Lime-Sulfur under three seasons' work at the University experimental orchards, located for the most part in southern and central Illinois.

Dry Lime-Sulfur in three seasons has resulted in no fruit or foliage injury when combined with standard arsenates of lead as a summer spray for apples. In all of our experimental work, the Dry Lime-Sulfur was used at the rate of three pounds in fifty gallons of water. As a fungicide, it has proved equally as effective as the lime-sulfur solution, both in the control of apple scab and of the common diseases found on orchard fruits. It is also worthy of mention that the finish of the fruit in all cases has been very fine and in most cases has been superior to that secured with lime-sulfur or bordeaux mixture, or, in fact, any other fungicide which we have used.

I hope this answers your letter satisfactorily, and while there are a great many other things that might be said, I think this covers the ground pretty well as far as my experience has gone. Yours very truly,

W. S. BROCK,
Instructor in Pomology.

WSB/IP

North Yakima, Wash., Nov. 22, 1918.
A. B. Fosseen & Company,
Yakima, Washington.

Gentlemen:

In my dormant spray, in the spring of 1918, on your recommendation I tried out two 100-lb. packages of Sherwin-Williams Dry Lime-Sulfur. In using this material I picked the dirtiest, worst infested part of the orchard to give it a thorough test and was more than pleased with the results obtained, as compared with the other brand of spray which I used. The comparative first cost of the spray was about the same, with the cheaper handling charge in favor of the Dry Lime-Sulfur. I found it worked readily into solution and had no trouble whatever of sediment in the spray tank and pumps. The results obtained were really a surprise to myself when compared with the trees adjoining that were sprayed with the liquid which I used, and I have no hesitancy in recommending the Dry Lime-Sulfur to anybody who has either a clean or badly infested orchard, as I think, with proper application, the Dry Lime-Sulfur will absolutely clean up their orchard. Yours very truly.

(Signed) E. C. VAN BRUNDT.

RICHARD DALTON
Fruit Grower
Saverton, Mo., Sept. 27, 1918.
The Sherwin-Williams Co.,
St. Louis, Mo.

Gentlemen:

According to promise to your Mr. H. P. Reeds, I will tell you of my experience with your Dry Lime-Sulfur.

Early in the spring I ordered two barrels of this material to try it out. I wanted to give it a real test, so I applied it on a peach orchard that was absolutely vile with scale. I gave this orchard an application of S-W Dry Lime-Sulfur at rate of 10 pounds to 50 gallons of water, and can truthfully say that these trees are positively clear, free from scale and seemingly clear of any disease whatever.

The material goes into solution perfectly and does not clog the spray nozzle.

I shall use it exclusively next season.

Yours very truly,

(Signed) RICHARD DALTON.

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Dry Lime Sulfur can be used for any purpose in the orchard for which Lime Sulfur Solution is now employed — as a dormant spray against scale insects and as a summer application in combination with Arsenate of Lead. The letters reproduced tell still another story of satisfied users. Read carefully the letters from State Experiment Stations at the left side of this page.

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The Outlook for 1919.—Already some fruit growers are becoming agitated over the bumper crop that is predicted for 1919. The 1918 crop brought high prices—in fact higher than for several years in the past, and the industry is in a most stimulated condition. Fruit growers were never so prosperous, and never before was the outlook so rosy. The fruit industry has been through the fire and many growers have suffered severe losses, but good crops and high prices for the past two years has shown the growers what a wonderful future there is in store. The fruit grower will spare no expense to produce a clean crop of apples. But there are some who are pessimistic and are taking into consideration the fact that many orchards planted just before the slump are now coming into bearing, and with this increase the demand for apples will not be so keen and prices will be low. It will be remembered several years ago statistics were compiled by some men connected with the railroads showing the number of acres planted to apples. They figured the last year of heavy planting was in 1912—this would mean that practically all of the commercial orchards in the Northwest would reach bearing age in 1920. A conservative number of boxes was allowed per acre, and their statistics showed that in 1920 there would be shipped from the Northwest about 150,000 cars of apples.

1912 was the first year of low prices, and we all know the result. Many growers who had young orchards left their places and the orchards were neglected and later dug up. Many promotion companies who had planted large tracts were forced to give up their plans. Many orchards were planted in districts entirely unsuitable for apples and the result is the tonnage in 1918 was not as large as 1917 by a few thousand cars, which is evidence that the increasing acreage coming into bearing has not increased the production of apples. From Europe comes the cry for more apples, and many districts are reporting their crop entirely sold, of which probably 90 per cent has been consumed in the United States. The demand for American apples in Europe will be very strong for the next few years. Many of their orchards have been entirely destroyed—others have been neglected because of lack of spray material and labor to do the work, so that the bearing acreage in Europe is very much depleted. There is no reason why fruit growers of the Northwest should cross a bridge before they come to it.

It is the opinion of Better Fruit that no estimate should be given out until after the June drop. Many districts give out estimates at blossoming time. A few years ago the writer remembers very heavy rains occuring during blossoming time, which materially injured the set. Some orchards show a splendid set before the June drop, and have produced only 50 per cent of a crop. And even after the June drop it is impossible to estimate the commercial apples that will be shipped, due to the fact that heavy losses may occur after that time from scab and codling moth, which during some years has meant a loss of 30 per cent of the commercial fruit. So it is our advice to go slow on giving out estimates of the crop of the Northwest until the apples are half grown, and it is not a case of guess work. The writer does not mean that we should not be fully prepared to take care of a bumper crop should it come, but judgment should be used about giving any figure on estimates too early in the year.

HE'S TAKIN' "BETTER FRUIT"

Summer's comin' and insects, too, and codlin moth to boot;
But say, I ain't worryin' none, for I'm takin' Better Fruit.

Last year them bugs was awful bad, but now they've had to scoot;
I'm wised up now — know what to do — been readin' Better Fruit.

I uster think this sprayin' talk—like many ernother galoot,
Was mostly wind; but say, it ain't; found out in Better Fruit.

See them trees; don't they look fine, from tip-top branch to root?
You bet they do; no bugs nor scale; sprayed by rules of Better Fruit.

This magazine is helpin' me; its horn I plumb must toot,
For things is comin' my way now on account of Better Fruit.

My crop 'll pay me well this year—in fact, I'll have the loot.
No use to explain—you know the rest—Subscribe to Better Fruit.

W. H. Walton.

THE OUTLOOK

The fruit outlook for 1919 in the Pacific Northwest is indeed bright. Last season was a banner year for prices and good average sales were obtained from both large and small fruits. As a result, this year finds a greater interest being taken in fruit production than has been seen for many years. By-product factories are being established in different fruit sections. New canneries are in course of construction in many sections and the industry, as a whole, is coming to the front on a sound basis.

The returns from fruit districts of the Northwest last year ran into many millions of dollars, with profitable returns to the growers. We cannot help commenting at this time on the fact that those fruit growers who carried on their work intelligently through those trying years of the past have won out. Many of these men have made apples, pears, prunes or nuts their leaders, others small fruit, but the successful ones have looked for leaders and made that business pay good dividends, taken one year with another.

The market problem is an important one, but it is not the only one to be considered. Successful fruit growing means a combination of all of the factors in the business—just as the war was won, not by any one factor, but by all working together. To build a market, there must first be a first-class article offered. Good fruit, properly graded, will top the market just as first-class animals top the live-stock market, and so good cultivation, spraying, good varieties, proper grading, standard icing of cars, good packages, all contribute to the profit in the business.

Better Fruit in the past set the standard for a guaranteed pack and established a reputation for Northwest fruit products that must be maintained in the years to follow. By communities co-operating together for better fruit, better grades and better markets, the outlook for the 1919 crop in the Northwest is flattering. We want to help our readers in every way possible, and we can only do this by all pulling together in the solution of those problems in which all are vitally concerned.

Reduction of Apple Rates on Export Shipments.—A reduction in freight rates to Great Britain has been made by the North Atlantic Conference Lines of 66 per cent. This will mean that the freight to European markets on a barrel of apples is reduced from $5 to $3, and on a box of apples from $1.25 to 85 cents. The demand for apples is very keen on the English markets and buyers are finding it impossible to meet the demand. It is expected the export trade will assume enormous proportions during the coming season.

An old pear tree was recently cut down for firewood in Virginia, having passed the bearing age, that was known to be more than two hundred years old. A few years ago thirty bushels of pears of excellent quality were gathered from this tree, but it began to show the debilitating effects of old age, and would probably soon have fallen.

Several bearing orchards in the Wenatchee district have recently been disposed of at a figure around $1,000 per acre.

About $16,000 will be spent for new warehouses this season in Yakima, Selah and Henrybro by the Growers' Service Company, which is ready to start work on the addition to its local warehouse as soon as arrangements with the O.-W. R. & N. Company, from which it leases the land, are completed. The improvements here will double the capacity of the present warehouse, which is about 200 carloads, at a cost of $4,000 to $5,000.

A deal is now pending for the sale of the present Selah warehouse and plans are completed for building a new warehouse of treble the 150-carload capacity of the old one. Bids on the work are now being awaited and work will start as soon as they are awarded. The building will be of frame construction, insulated with mill shavings. At Henrybro an addition to the present frame warehouse will be built to double its present capacity of 100 carloads, giving the company total storage space for 1,050 carloads of fruit.

Pruning the Walnut Tree

Continued from page 22.

dency. With a little care, leaving only branches that have good unions, from three to five in number, a very satisfactory head can be made.

Where trees are making a rapid growth I would advise letting two or three branches grow along the trunk below those intended for the head. These will have a tendency to increase the size of the lower part of the trunk and absorb part of the growth that would otherwise go into the top branches, causing them to grow too rapid and droop. Care must be exercised in this work in regard to how many branches should be left. In heading about 600 young trees last summer this rule was followed. The first time over, about June 1, about three to five branches were left; a month later some of these were removed if the top was not making growth enough; again about August 1 others were removed where the growth showed any weakness. On the last two trips about 75 per cent of the number first left were removed. Had the season not been so dry it would not have been necessary to remove so many branches. All of the remaining branches should be cut off during the dormant season. The branches that are to form the future top should be cut back to about thirty inches.

Last season during the walnut tour a study was made by several of the center-leader tree. The conclusion reached in general was that this type is very good, if not the best, for a walnut tree. Last season I trained several hundred young trees with a single shoot up to eight or twelve feet. It is my purpose to train these into center-leader trees having two or three sets of from three to four branches, one above the other, instead of one set. These should be headed a little higher, as the lower set of branches will grow out more nearly horizontal when there are more branches above them, making very much stronger unions than when the branches come out at sharper angles. It may be necessary to nail an extension on the stake to support the top the first season. This type of tree requires some extra labor but is by far the strongest when once established.

Sharp angle forks should always be avoided in the structure of the walnut tree, and these forks should be cut out at almost any cost in shaping the tree, as sooner or later they will surely split down and may cause the loss of the whole tree. But if these forks are found on trees too large to remove one branch without much damage they can be greatly strengthened by boring a five-sixteenths or three-eighths hole through both branches above the forks and inserting a piece of soft steel or iron the same size a little longer than the distance between the outside of the two limbs. The ends should protrude about an inch, and with a little care can be clinched down without doing much damage. These will grow over and greatly strengthen the fork. In larger trees heavier bolts can be used.

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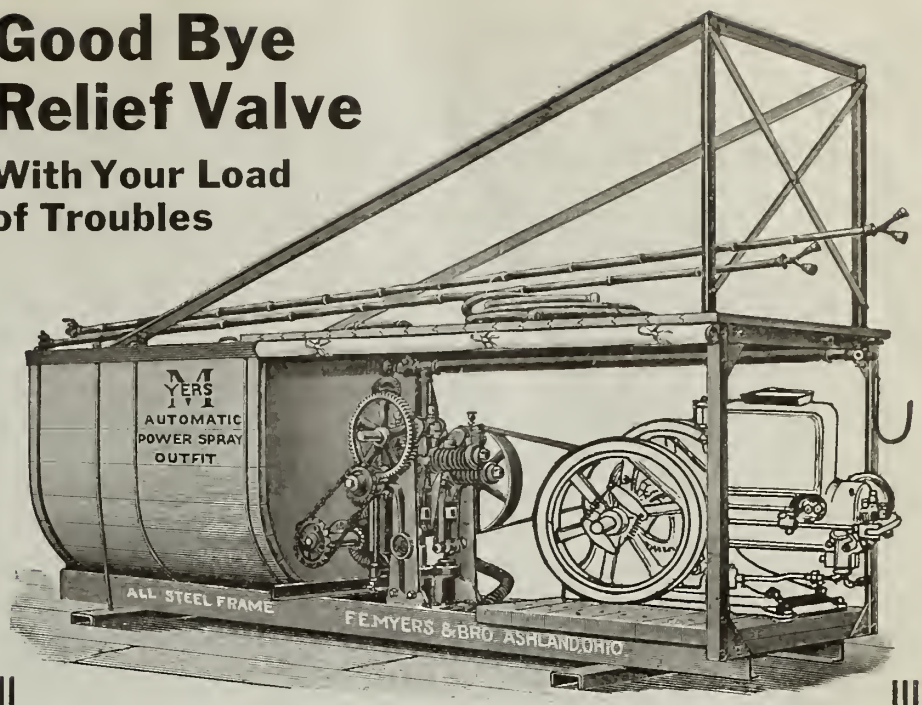

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The elimination of the relief valve on the new MYERS SPRAYER by means of an automatic pump that ceases operation when desired maximum pressure is reached and resumes when pressure drops to normal, is a great forward step in Sprayer construction. It saves wear and tear on pump and engine. Saves fuel and prevents damage that occurs when a relief valve fails to relieve. MYERS SPRAYERS have many other superior features, including a very strongly built frame. We sell MYERS SPRAYERS as you want them, with or without engine or truck. The best combination however is THE MYERS OUTFIT, equipped with one of our dependable **Stover Spray Engines** and mounted on one of our short turn steel wheel trucks. Send for circulars. We carry the full line of MYERS SPRAY PUMPS.

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PORTLAND SPOKANE

Walnut trees are much more likely to develop weak forks than fruit trees, and require the greatest care up to four or five years old. The next five years very little care will be needed, but from about the tenth year some pruning should be done to open up the tree to let in more light and give better air circulation as well as to dispose of surplus wood. Many orchards in the Northwest have reached a stage where they have ceased to bear good crops of nuts owing to crowding and lack of pruning. Walnuts do not need pruning every year like fruit trees, but they need some pruning as they grow older. Many trees grow small nuts if left to grow their own way as they grow older or begin to crowd. It was plainly evident in some of the older orchards last season that the lack of proper pruning caused their owners a loss of several thousand dollars. In California for several seasons past a regular system of pruning has been practiced. No doubt this practice will soon be taken up here as the orchards grow older. The walnut has no characteristics of the ordinary fruit tree and needs a system of pruning all its own.

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Soil Packing—Prevention and Restoration

By C. W. Krues, Oswego, Oregon

As the process of restoring packed soil to a mellow state does not in any way relate to the process whereby it is packed, you cannot undo it by backing up as one would unravel a piece of knitting to arrive at the beginning; or, if being injured by falling headlong over a log one might reason that to fall backwards over the log might remedy the injury. Some things can be handled on that theory. For instance, a lazy man who is seeking an excuse to quit picking blackberries when his wife wants a few to can—but not packed soil.

Anyone without much thought can easily pack a field by mudding around in it, and the nearer this is done to the time when dry weather sets in the better the job will be. The first thing one should consider is prevention as far as possible, because restoration is a slow and tedious process, especially on black, low soils that tend to be mucky.

However, before going into preventions or remedies, let us be sure we know how to pack soil in the various ways. Late spring plowing, when the ground is too wet and already laying heavy, done just before a dry windy spell of weather, is usually considered to be one of the best ways to pack soil; but I will tell you this is only a small part of it. Of course, it is a wrong start, but most times the job of soil packing gets the "final wallup" when the harrowing is done too soon. The farmer thinks the clods are going to give him a "heap of trouble" if he doesn't break them before they get too dry, consequently he goes on as soon as the surface looks good, and while he is making two or three inches of the top soil look good to the eye he is packing a greater thickness just below this layer by the horses' hoofs stamping the air out of the ground and pressing the soil so as to facilitate its natural cementing quality, which takes place before the plant roots have access to it, or, perhaps, plants have not yet been put out, which if out leaves the roots to search around in the few inches of mellow soil on top and when dry weather sets in they find themselves standing on the surface, which soon dies out and they are done unless favored by an early fall rain.

If you will grow vegetables or even many other crops you must have air, together with moisture and fertility, which means fine loose ground to a great depth and planted immediately after preparation so the little tender roots can ramify downward and to the greatest possible distance before the soil settles and its particles begin to adhere and obstruct their growth.

Remember, if you keep moisture without air your crop will be a failure, also unless you are growing swamp-grass, nettles, skunk cabbage, or something that desires wet feet.

The school of experience has charged me a fair price for many of my experiments on handling soil. I once had about four acres of very rich soil which had been fall plowed. I wanted to plant this field to cauliflower. I thought that, by starting early and keeping it mellow and fine on the surface, I would retain much moisture as a store to resist the dry weather period. Accordingly I went over it with a four-horse disc, cutting as deeply as possible—doing this in the latter part of April. Although the surface was dry, the soil clogged between the discs and I had to frequently dig it out. I gave this field about three discings, drag harrowing and clod-mashing about thirty days between each set of operations and had a surface that would please the eye to look upon, with an abundance of moisture right up to the very top at planting time, about July 1. I finished planting in good shape and everything looked promising until about the first of August, when the plants came to a standstill, and I discovered that the soil would not hold moisture; it really had no dust on the surface; it was just fine and mealy. The plants were drying out and I was powerless to help them. I made a one-horse float, on which I

stood, and went through the rows, but to no avail, as the soil beneath each plant was caked and hard; my horses had done this while I was preparing the surface—I was spoiling the lower soil. This was about twenty years ago. I have since seen a great deal of soil packing by other farmers who thought it was necessary to hold moisture, but in reality it proved a sad mistake.

The continual working of soil to make it fine in order to hold moisture is sure to cause it to run together and be slower to loosen up the following year. It is inclined to grow steadily worse year by year as truck crops are grown, and how to avoid this condition or overcome it as far as possible is one of the greatest problems of the garden-truck farmer.

In the production of broccoli you cannot avoid going upon the land to harvest your crop; but step as lightly as you can, or, in plain words, don't take a heavy wagon and two big horses out astride the row and haul the broccoli out, when you can make a hopper rig out of an old eight-foot hay rake and put one horse to it and go astride two four-foot rows cutting at least four rows at a swath. Two men can follow behind, cutting two rows each or three rows each as desired, allowing the muzzled horse to go and stop at call. The advantage is a light rig, a high rig and the cutters walking so as to look right into the heads without unnecessary movements. The heads can be laid into the hopper without damage by bruising, which should be large enough to hold ten dozen. There is no better or easier way.

When the crop is off take a disc harrow and go astride each row. The two center discs will split or cut the stalks up so that they can be plowed under; but don't work too wet. Then take an 18-inch plow with a good substantial jointer on it and plow deep and keep straight with the rows, managing to plow right up to each row as you come to it, so when the next furrow is plowed the jointer will run just to the left of the broccoli stalks. This will give them a complete turn-over and cover. You cannot cross back and forth through the broccoli row with your jointer and make a job of it. The rows must necessarily be straight. By covering the leaves and stalks well under they will soon rot, except just a small woody portion of the stalks. Keep off this field now—if not too many weeds come up—until after the June rains have slacked the surface. Let it first get dry, and by being rough few weeds will grow. If, however, they appear run over when they first germinate with a drag harrow with the teeth well slanted back so as to prevent jerking out the broccoli stalks. About June 25 or July 1, run over with a drag harrow and heavy clod-masher, then follow with a disc, and you will be surprised how few "clubs" you will find; but be sure to mash all the clods before discing, as afterwards they will sink into the loose soil and not mash.

No clod-masher is heavy enough to pack soil, and by discing the dry surface under and exposing fresh soil, which can be easily handled before getting too dry, you will be in no danger of packing the soil. You have no business in the field with a disc harrow after June 1 if you need cleaners. In fact, a cloud of dust should follow your clod-masher. You may imagine your soil is so dry that no moisture will ever come back, but just get two or three inches of dust mulch as fine as flour on the surface and in two or three weeks you will be surprised how the old earth can sweat under such torture. This moisture that steams up during the hot days and is condensed under the blanket of dust by the cool nights is incomparably better than rain water, as it brings fertility up from the subsoil with it which has been washed down during the wet periods. In this manner you may take a field of dry ground, and the longer it has been dry the better, because you must know that colds have to go through a slacking process which can only be accomplished by having them perfectly dry to the heart; let them get so dry and compact that, literally speaking, they are in great agony. This condition fits them for decomposition. Too much harrowing prevents you from getting much of the surface dry. Now they are ready for turning into dust, and dust you must have. Harrow and slide them down, and if possible to get a light rain on the surface which does not penetrate more than two or three inches they will retain some of this moisture long enough for you to give them another going over, and this time they will be both air slacked and water slacked. Bear in mind you cannot slack clods with water only; if you do, the particles will not be fine like dust and later your moisture will escape which you thought you were conserving.

To accomplish the best results, much depends on how good a manager you are and how the season favors you. There are times when one-half day's work, if put in when conditions are right, will accomplish more than two or three days of hard clod grinding under improper conditions. Of course,

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COST TABLE

LIME-SULPHUR SPRAY FOR SAN JOSE SCALE.

Cost of Concentrate Per gallon	10c	11c	12c	13c	14c	15c	16c	17c	18c	19c	20c

COST OF DILUTED SPRAY, IN CENTS PER GALLON.

Dilution Gal. Conc. to Gal. Water	c	c	c	c	c	c	c	c	c	c	c
1 to 5	2	2.2	2.4	2.6	2.8	3	3.2	3.4	3.6	3.8	4
1 to 6	1.66	1.83	2	2.17	2.33	2.5	2.67	2.84	3	3.17	3.33
1 to 7	1.43	1.57	1.71	1.86	2	2.14	2.28	2.43	2.57	2.71	2.85
1 to 8	1.25	*1.37	1.5	1.62	1.75	1.87	2	2.12	2.25	2.37	2.5
1 to 9	1.11	1.22	1.33	1.44	1.55	1.67	1.78	1.89	2	2.11	2.22
1 to 10	1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2
1 to 11	.9	1	1.09	1.18	1.27	1.36	1.45	1.54	1.63	1.72	1.81
1 to 12	.83	.91	1	1.08	1.16	1.25	*1.33	1.41	1.5	1.58	1.66
1 to 13	.77	.85	.92	1	1.07	1.15	1.23	1.3	1.39	1.46	1.54
1 to 14	.71	.78	.86	.93	1	1.07	1.14	1.21	1.28	1.36	1.43

ESTIMATED AMOUNT DILUTED SPRAY PER TREE.

Age of trees, years	3 to 6	7 to 10	11 to 14	15 up
Approximate amount, gallons	2	4	8	16

*Examples 100 trees 13 years old, 8 gallons to tree, equals 800 gallons.
Using 1 to 12 dilution (spray costing 16 cents a gallon) 800 × .0133 = $10.64.
Using 1 to 8 dilution (spray costing 11 cents a gallon) 800 × .0137 = $10.96.

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you must be prepared and act quickly under favorable conditions or else be a "good sport" and also prepared to just grind the clods by sheer force of weight if the time has passed by or never came.

Rollers are of very little value. I have a 10-foot clod-masher with a hinge in the center to which I hitch six horses and shovel about one ton of dirt on it in bad cases. It has a way of its own in putting its ear right down to the ground so it can hear the grumbling of the clods as they powder out behind, while it communicates to them how to do it. Don't forget, it takes power to force clods to yield. I also have a 24-tooth spring-tooth harrow which four horses cannot run when set eight or ten inches deep. I have this so I can get below horse-track depth as much as possible, and also to hook up any chunks which need pulverizing. Here is where I get the air in the ground; and instead of having three or four inches of mulch I have eight or ten, which furnishes a root bed as well.

There are some kinds of soils which will not respond to any ordinary methods. An abundance of straw plowed under in the fall will help a great deal, and something should be kept growing during the winter on such land. This will keep the soil loose, prevent washing and retain as much fertility as the plants hold. Yet with all you can do it will be necessary to give the soil a change for other reasons than clods. If broccoli or cabbage is grown continuously on the same field the keeping qualities will deteriorate and necessitate the use of potash to give them firmness.

I class buckwheat as king of all crops to bring back packed soil. Its fine roots have a way of ramifying in all directions, and possibly the acid from their decayed state helps to separate the atoms of the soil; anyhow, let it be as it may, the results are forthcoming and the straw rots exceptionally quick. If you do not care to harvest the crop, plow it under in the fall after the grain has sprouted. (Better run over with a disc to insure sprouting so as to avoid volunteering.) Sow vetch and let it stand late next spring—say about May 1, and plow it well under with a jointer when the soil is rather dry. Plow as shallow as you can to get a good job of it. Later disc as deep as you can—say about June 15—and be sure to cut through all the vetch plowed under and turn as much as possible of it to the surface. Most men fail because they do not have heavy enough equipment to cut deep. I have a 20-inch disc harrow, and wish it was 24 inches. The 16-inch discs are a plaything and a bluff at the job.

If you have a strata of vegetation between the surface and subsoil you will be stung at harvest time in proportion to the thickness of the strata which prevents the soil from holding moisture above it.

I believe land plaster causes the soil to become sticky. Sand is what the soil really needs. I have a piece of low, black, sticky soil. I allow the wash from the fields above to run in on it, which has greatly improved it.

Tile draining is one of the most beneficial things to soil, as it prevents the filling up with water in winter. By lowering the water level the air is allowed to penetrate deeper, which keeps the soil mellow. You will find 50 per cent less clods over or near the tiles than between them if laid too far apart. I have laid several miles of tile and have no cause to regret the expense. The length of the season for working the soil is more than doubled and the harvesting period is made comfortable and safer, with many crops, as well as preventing soil injury. I have seen that plants standing upon wet soil receive far more injury from frost than those standing on drier soil. They have a slow way to recuperate when the thaw comes on.

Big tough plants are necessary, well hardened and long tap roots, so they can be set deep. Late planting is preferable on account of frosts. Spray the beds for aphis prevention. Dip the plants by placing in box with perforated lid. Use soap.

Spray for Peach Leaf Curl

The most injurious diseases of peach occurring in the Hood River Valley are peach leaf curl and California peach blight—both of these troubles are readily controlled by proper spraying. Of the two diseases, the leaf curl is the most noticeable. The fungus attacks the foliage, causing the leaf tissues to become puffed and warty and which drop from the trees during June and July. When an extreme premature defoliation occurs much injury results to the tree and the crop on the trees becomes practically worthless. This fungus becomes active with the swelling of the buds, spores entering and attacking the young developing leaves before they issue from the buds. Control measures must be undertaken before the buds begin to crack open. Spraying either in the fall or early spring will give good control. If the trees were not sprayed last fall an application of lime sulphur should be made in the very near future or it will be too late. Lime sulphur 1-10 should be used. At this strength San Jose scale will be controlled and much good will result in checking the development of the blight.

This latter disease attacks all parts of the trees, spurs, twigs and branches as well as the fruit, causing a very noticeable exudation of gum. The fungus causes reddish brown cankers, which gradually become so numerous as to girdle and kill the twigs and limbs of the trees. For complete control of this disease the trees should be sprayed at least three times during the season. Spray again after the petals fall with atomic sulphur, 10 pounds to 100 gallons water, and again before the fall rains come with bordeaux mixture at the rate of 6-6-50.

Want a New Spray Law

Unlabeled spraying material and sprays of the non-arsenical kind, both of which are reached by the present Washington horticultural laws only in a vague and unsatisfactory way, came up for consideration at the recent meeting of the Washington Insecticide Board at the State College, and, acting on the evidence in hand, the board decided to recommend to the present legislature certain amendments to the law which will serve as a protection to fruit growers using various spray preparations.

Dr. A. L. Melander, secretary of the board, states that in order to make the law more inclusive and applicable to recent conditions that have arisen, the board recommends legislative passage of a law requiring, first, that every package or container of spraying material offered for sale in Washington be labeled; second, the label to show the name, brand or trademark under which it is sold, the purpose for which the material is to be used, directions for its application, the name and principal address of the manufacturer or person responsible for placing such commodity on the market; third, a correct statement of the character and name of each insecticidal or fungicidal ingredient used, and the minimum percentum of such active ingredient and the maximum percentum of inert ingredients in the package.

It is explained that the present law applies mainly to arsenical sprays, but does not effectively apply to lime sulphur, oil emulsion, nicotine and other non-arsenical sprays; also, in the letter reading of the law, the manufacturer of spraying material may offer almost anything for sale, so long as he does not label it.

PLANT A VICTORY FRUIT GARDEN Have Your Own Fruit Next Summer

We will send you postpaid ten Pure-bred Pedigree Fruit Plants, with complete instructions for planting. These plants will be furnished by the Portland Seed Company, one of the old reliable seed companies of the Pacific Northwest. They have been selected from strains that for generations have produced an immense crop of quality fruit. They are specially adapted to the Pacific Northwest climate and will be sent to you at the right time for planting in your particular section of the country.

Let the idle space in your backyard or garden produce luscious ripe Raspberries, Blackcaps, Dewberries and Blackberries. Nothing is more delicious than fresh ripe fruit picked every morning while the dew is still on the vines. Berries that you buy in the stores are usually shipped from a distance, which means that they are picked before they are ripe. Fruit that ripens naturally on the vine tastes different, infinitely better—and you can grow it in your own garden. We have selected for you a collection of five of the best small fruits, We want to send you two of each, ten in all. This will give you enough plants for a splendid home berry garden.

THE COLLECTION CONSISTS OF

2 Improved Lucretia Dewberry 2 Cuthbert Raspberry 2 Eldorado Blackberry
2 Cumberland Blackcap 2 St. Regis Everbearing Raspberry

Improved Lucretia Dewberry

OUR OFFER

Western Farmer, one year
Better Fruit, one year
and
Victory Fruit Collection

All for **1.75**

Eldorado Blackberry

Plants Sent Postpaid at Proper Planting Season

We will ship your plants at the proper planting season for your locality. These plants are exceedingly hardy and do not freeze easily, but we will hold them in our storehouse until such time they can be shipped with safety. This will depend upon whether the season is early or late, but you will be sure to get your collection at the proper time for planting.

Cuthbert Raspberry

Make Your Planting This Spring and Pick Ripe Fruit Next Summer

These Ten Fruit Plants have been selected from strains that, for generations, have produced immense crops of quality fruits. They are hardy and will grow successfully anywhere in the United States, and will not winter-kill. These plants will provide you with fresh fruit all season, and each year will produce profusely new shoots which can be transplanted successfully.

St. Regis Everbearing Red Raspberry

DESCRIPTION OF VARIETIES IN OUR COLLECTION

Improved Lucretia Dewberry

The berries, which are borne in heavy clusters, measures an inch through, and an inch and a quarter long. Incomparably sweet and juicy when fully ripe, and has but few, very fine seeds. By nature a creeper, the vine should be trellised. The large white blossoms are very attractive.

Cuthbert Raspberry

Large berries, of wonderfully sweet flavor, are borne in heavy profusion. The Cuthbert sets all its fruit at one time, and ripens it altogether. One or two pickings will usually gather the entire crop. On this account, as well as its quality, it is the favorite commercial raspberry.

Cumberland Blackcap

No collection of small fruit plants would be complete without the grand old Cumberland. The fruit is large, firm, of good flavor, and is borne in large clusters that ripen very evenly. The canes grow large and strong, enabling them to ripen tremendous crops of fine berries.

Eldorado Blackberry

Handsome in appearance and as beautiful in quality, the Eldorado has no peer among the blackberries. The canes grow rank and tall, and are literally covered with immense clusters of shining blackberries. For eating fresh, for pies, preserves, jellies or jam, the Eldorado is superb.

St. Regis Everbearing Raspberry

The St. Regis begins to bear before any of the other raspberries and continues after all others have quit. The fruit is of medium size and of very good quality. On account of the long season the vines yield immensely. You will secure a good picking every week from June to October.

Cumberland Blackcap

DON'T DELAY

This offer is good for 30 days from date only. You cannot secure plants of better quality or plants that will bear more quickly after planting. We guarantee the collection to reach you in good condition and to grow satisfactorily.

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Gentlemen: Enclosed find $1.75 for which enter my subscription one year each for Western Farmer and Better Fruit. Also send me at the proper planting time your Home Berry Collection.

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The Modern Agricultural Poison

MIXES easier, is applied in the same way, for the same purposes, in the same proportions — pound for pound — and with the same degree of safety from injury to foliage, as is good Arsenate of Lead. It spreads better, adheres longer, and COSTS LESS.

The above results were obtained in most exhaustive spraying tests extending over a period of several years in the Dow Experimental Orchards, Fields and Laboratory. We make these statements despite the fact that we are probably the largest producers of Arsenate of Lead in the world. The wonderful possibilities and the very low price of DOW MAGNESIUM ARSENATE we believe warrants your early request for delivered prices and full information.

The Dow Chemical Company
Midland, Michigan

Markets and Market Expansion

By A. H. Harris, Publisher of "Better Cooking, Portland, Oregon"

Continued from last issue

China is little understood by English speaking races, at best. China is a nation of fixed customs, of little change, of a peculiar cunning in commerce and trade. Failure of other nations to comprehend these facts has prevented the development of business in a number of lines, including the marketing of fruit. Americans will be a long time changing customs in China, but it should be a simple thing to adapt American trade practices to the will of a people as well fixed in every detail of buying and selling as are the Chinese. The only foreigners who have developed great trade in the Orient have been those men who at once adapted their business methods to the centuries-old practices of the Oriental counting house.

Perhaps I may be able to clear up a few of the popular misconceptions of China and the Chinese.

In the first place, China has an area a little more than half the land area of the United States, with four times its population. This fact has brought the people very close to the soil, and in China we find the best farmers in all the world. For four thousand years the soil of China has been tilled, and methods have been improved until it is thought maximum production has been reached. It is not lack of production that has stalled China on the road of progress, but the lack of transportation. China can produce among her own people, but she cannot distribute, except by the most crude methods of transportation. Her ports accommodate the great ships of the world, and she can land commodities in London—under normal conditions—quicker and cheaper than she can serve her own people living inland a few miles.

China is not a country of coolie labor exclusively, as many seem to think. China has millionaires, thousands of them. China's isolation among the nations of the world has made it possible for cunning men to grab and to hold, just as prodigal nature has made it possible for greedy Americans to gather the natural resources and make themselves millionaires. It is among this wealthy class of Chinese that market will be found for Northwestern apples. The poorer classes use native fruit—if they use any at all—and native fruit is both cheap and of extremely poor quality. This fact is of first importance in considering our subject.

The Siberian crabapple tree grows wild and has for centuries grown commonly all over Northwestern Asia. This tree has become the foundation for all the apple trees in China, and the quality of the fruit is fixed by the parent stock. All sorts of varieties of apple scions are grafted on Siberian crab stock, and all sorts of small and hard and poorly flavored apples result. With this poor quality of fruit the poor classes of natives must be content, but the better classes, the wealthy classes, demand

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HIGHEST GRADE GROUND LIMESTONE
(Ground to 20 mesh screen for soil use
Ground to extra fine dust for spraying)

Insures Better Fruit

We guarantee that the average of assays made from our natural rock or its product will show not less than 95%

Calcium Carbonate

(will probably show higher percentage) and that is what every fertile soil requires in its makeup of plant food. Ground limestone cannot hurt your land. It will surely warm and sweeten it; will drive out the harmful acids and unlock other plant foods; WILL ADD STRENGTH AND VIGOR TO YOUR FRUIT TREES AND ENHANCE THE QUALITY OF THE FRUIT; WILL STOP SCALE, SCAB AND RUST ON YOUR VEGETABLES. In fact, it's good for everything that grows, and remember this: human, animal or vegetable life will not thrive or live on poison. The soil will not, while filled with poisonous acids, absorb or digest plant foods.

Therefore, before you try feeding your soil high priced fertilizers, is it not cheaper and better to spend a little money putting it in condition to be benefited by them?

"LIMO"
MANUFACTURED BY
Tacoma Lime Products and Fertilizer Co.
Tacoma, Washington
WRITE US FOR INFORMATION

fruit imported from Japan or the American continent. At the present time Japan is the strongest nation in Chinese fruit markets, with the United States second, Canada third and Australia fourth. Australian apples reach China during the months of March, April and May only, hence they do not compete with American fruit offered in fresh state.

An interesting fact must not be overlooked. Chinese merchants never import apples. Native merchants will buy and sell fruits, but they demand that such perishable products as apples be delivered to them before they will buy. Chinese are cunning as well as close buyers, and they lose none of their skill in transactions which involve American fruits. Even with almost hopeless handicaps, seemingly, Northwestern apples have been going to China since 1892, and with an increasing demand. The figures for imports into China are interesting.

In 1892, 8,959 boxes were received. Ten years later the number had grown to 20,061. In 1912 the demand had decreased or the supply had run short, for only 11,904 boxes were received, as against the high mark, 24,783 boxes, during the year 1909. Fro the year 1917, with the war raging in Europe and shipping in a stranglehold, 16,566 boxes of Northwestern apples found their way to China. These apples were received at Shanghai, where the 1917 supply sold as high as six dollars per box, in Mexican money. Ocean freight on apples to the Orient has ranged between 30 cents and 90 cents per box, the latter rate being fixed after the war had taken most of the Pacific Coast shipping.

In developing the apple field in China Canadian dealers have led the way, principally because a large percentage of foreigners in China are of English blood and show a preference for fruit shipped from as near the old home as possible. Then the Canadians have been wiser in choosing varieties and in packing for the foreign market. There has been no refrigeration on shipboard between the Pacific Coast and the Orient, and apples must be packed especially for the long journey. It is an unfortunate fact that Canadian apples sell for much more money on the markets of Hongkong or Shanghai than fruit from the United States. The Canadian varieties sent abroad are of the best, while the early exporters from this country sent Ben Davis and other varieties which stand well down the list as to quality, but which stand up strongly under the long sea voyage and can be sold out of season without being held in cold storage.

The Chinese is not partial to large apples; in fact, he prefers the smaller sizes of American stock. A pack of 150 apples pleases the average consumer, but the stock should be of the best varieties. It has proved a mistake to send second or third class fruit to the Orient, and a lot of good trade has been lost through the practice.

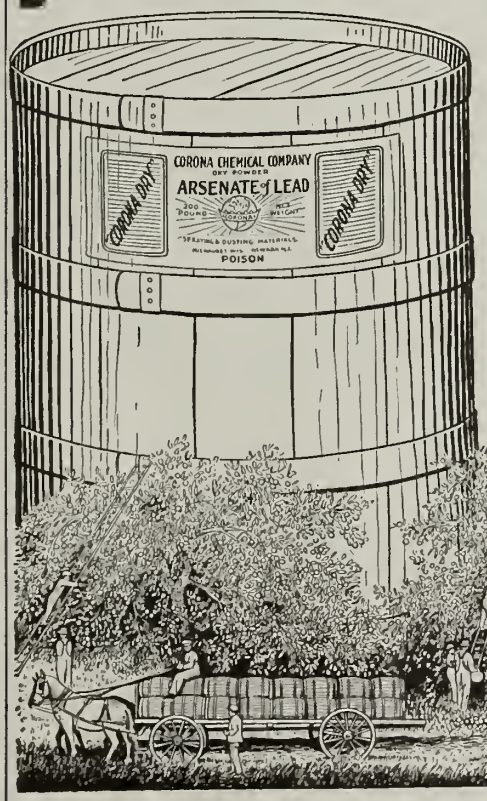
Not all the problems involved in marketing Northwestern fruit are to be found in foreign expansion plans. At

"CORONA DRY"
The Universal Insecticide

"The Package Behind the Pack"

FANCY FRUIT sells on sight at prices that build bank accounts for the growers. Wormy, low-grade fruit sells slow at any price—seldom pays the cost of marketing.

For clean fruit, you must spray with the right materials. The poison must be full strength and distributed evenly on the trees. That's why many well-known Fruit Growers' Associations have placed huge orders for "CORONA DRY"—the Universal Insecticide. They have learned that clean fruit and healthy trees result from making this famous, powdered arsenate of lead "the package behind the pack." "CORONA DRY" has been used and endorsed by leading orchardists since 1912. The big commercial fruit sections of the country now consume many carloads yearly. You owe it to *your* business to find out why. A postal will bring full information. Send it today.



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U. S. "Protected" rubber footwear is specially built to stand wear and tear. It's the double-duty kind of rubber footwear, reinforced for longer service—the kind that positively keeps out the wet and chill of rain, slush or mud underfoot. During the war, the Government probably used more U. S. "Protected" rubber footwear than of all other makes combined.

Every pair of U. S. "Protected" rubber boots bears the "U. S. Seal"—trade mark of the largest rubber manufacturer in the world. Look for this seal. It insures "U. S. Protection," saves your money, safeguards your health.

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home, the apple and the prune do not find as many enthusiastic supporters as either should. While sales methods have been improved, so far as the producer is concerned, in the retail trade crude methods still exist and the effective advertising done annually is confined to a small part of the active trade. From one end of the Northwest to the other, apple window displays this season have been inferior, and in many cases the grades offered consumers have been irregular. In other words, the local market is being neglected or qucered, as the case might be, and so far as I know there is little constructive planning for the development of future trade through increased consumption of Northwestern fruits.

In the Eastern centers, as well as in Portland, Seattle, San Francisco and other cities, the grocery and supply business is passing into the hands of men of foreign birth, a trend which means more or less hard luck to the producer. Greeks, Turks, Hebrews and Italians are close buyers and cunning sellers, and their control of the fresh fruit business in this country must necessarily mean a breaking down of grades and prices. Following the war, this condition does not appear attractive to me, yet it may not be as far-reaching in its effects as at first would appear.

The entrance of a large foreign population into the fresh fruit marketing game adds importance to the off-grade stock and undesirable sizes. With market conditions regulated from the bottom up, instead of from the top down, prices are likely to be depressed, and grades lowered, either consciously or unconsciously. With grades broken down the Northwestern apple will have trouble, as it will be driven into close competition with barrel stock in Eastern centers. Strict regulation of grades, perhaps by the Federal government, might prove an effective way of keeping conditions from becoming worse in this respect.

Fruit producers and fruit dealers should take advantage of the ground gained through the effect of the war on the diet of the peoples of the world. Not alone did the American people learn that fruit and vegetables should occupy a more important place in the diet, but everywhere lessons of conservation and thrift were learned. The values of food commodities have been studied as never before. The good work should be kept up, not alone for the financial consideration, but also from the angle of better health and the development of the diversified resources of the country.

To bring about increased use of fruits is one of the chief problems before the producers of the Northwest. To send apples to the four corners of the earth would be the height of ambition. To give apples and other Northwestern fruits a permanent place of importance in the diet of our own people, and to thus place horticulture on a new and higher plane, would be an achievement worth while for every man and woman who claims Oregon, Washington or Idaho as home.

Hood River Strawberry, Etc.

Continued from page 16.

work. Consequently from the meager data at hand we do not feel justified in forming definite conclusions along this line. In one test with plants bearing their first crop it was found that yields were consistently increased by applications of barnyard manure. The plants were quite vigorous, having been set on clover sod recently turned under. In another test, evidence tends to support fall applications as compared with spring applications. The evidence in this respect was not consistent in all cases, however.

The question has been raised regarding the probable number of years, barring insects and diseases, during which a patch may be expected to bear profitable crops. I wish to present at this time some evidence furnished us by a grower who produced his berries between tree rows, as is the custom in the valley. The patch covers six acres, approximately, but since a wide strip has been left on each side of the tree row the actual acreage in berries is much less than this. These plants have borne six crops. They were set on new ground (Red Shot) which had just been cleared. The use of clover or other leguminous crop as green manure was not made, nor was any commercial fertilizer employed until after the third crop when blood meal was used. In the late summer of 1916 a 100-pound application per acre of nitrate was broadcasted when topping was completed. The owner was so impressed with results that he made a similar application during the summer of 1917, hoping thereby to get one more, the sixth, crop. The yields are reported as follows:

	Packed crates	*Pounds field pick for cannery*
First crop	515	....
Second crop	637	3043
Third crop	465	1512
Fourth crop	601	7056
Fifth crop	667	5557
Sixth crop (estimated)	350	....

As will be seen, the largest crop secured was the fifth one, following an application of nitrate the previous summer. Yields for the last year are estimated. A few more than 300 crates were packed out when, owing to the shortage of labor, picking was discontinued with many berries yet to be picked.

These yields not only throw light upon the subject of the length of life of the strawberry during which it may produce commercially, but upon the practical value of using clover as a green manure before plants are set. They do not compare favorably with those yields recorded in the chart shown here. However, that it paid the owner to take a sixth crop before plowing up the patch is found in the fact that, owing to good prices, he realized over $500 therefrom. In this patch we conducted some experiments in 1918 which show some very encouraging evidence to support summer applications as compared with those put on in early spring.

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Pressure Control. No diaphram or relief valves to give trouble on the Alpha. Pump pressure is closely regulated by a simple automatic device on each plunger rod. No part of it is subjected to the corrosive action of the spraying solution. When the pressure reaches the predetermined limit the plungers automatically cease operation, the engine runs idle, thus saving unnecessary wear on both pump and engine.

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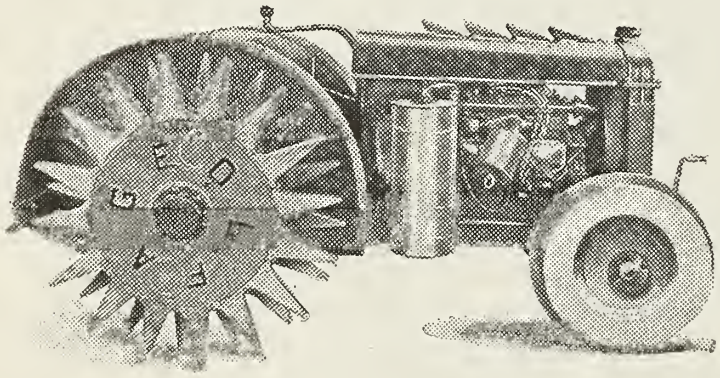

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commercial fertilizers without the use of clover there is little evidence to support the idea that yields will compare favorably with those where clover, alfalfa, manure, etc., are used as a basis. This is a recommendation especially applicable to growers of berries on some of the lighter soils in the Lower Valley where water-holding capacity and fertility are often poor on account of the lack of humus. On strong soils the need of additional fertilizer is relatively less than on the lighter soils. Probably on all soils a moderate amount of nitrogen in a readily available form is desirable. Where plants are inclined to make tardy growth during the first season before production begins the use of nitrate should be profitable. The aim should be to secure a good, big thrifty plant which is capable of bearing a large crop. However, avoid extremes.

In the use of nitrate let me urge moderation. During hot picking seasons such as the two last, there is grave danger of producing soft berries unless they are picked very promptly. During a cool picking season the danger is relatively less. In this respect it will be interesting to know that the number of picking days in 1915 and 1916 were 49 and 38, respectively, versus only 23 and 25 for 1917 and 1918; this as measured by the dates of first and last carloads of fruit shipped by the association. As will be remembered, we did not secure a good response from the use of potash. In all fairness, however, will say that the berries from plants thus treated were somewhat firmer and possessed better shipping quality than those taken from the heavily nitrated plants. Possibly when potash is again available it will be advisable to use this in the combination of fertilizers used. Data appears to bear out the idea that conservative practices will give the best results. Probably not over 220 pounds of nitrate per season can be considered safe. During some seasons this may be too much. Whether to apply in one or two applications will depend upon the character of the soil very largely. With porous soils such as that used in this test, the two-application plan has proved wise. We would advise the grower to make suitable tests under his own conditions in order that our store of knowledge along this line may be increased.

Recommendations.

First of all, the evidence in favor of the use of clover as a green manure crop is very clear in that yields are greatly increased even on virgin soils such as those on which these tests were made. In this way increased yields are secured cheaply in that the need of additional fertilizer is relatively less. However, as may be seen, still further increases in yields are possible by the addition of commercial fertilizer such as nitrate, which has given greatest gains. On the other hand, while great gains may be secured by the use of

		Pounds Per Year		TEST No. 1 Crates per 10,000 Plants				TEST No. 2 Crates per 10,000 Plants			
Plat No.	Kind of Fertilizer	Early Spring	Bl'ss'm Time	1916	1917	1918	Avg.	1916	1917	1918	Avg.
1	Nitrate of soda.....	220	...	257	230	110	199	302	148	161	204
2	Nitrate of soda.....	...	220	356	306	133	295	...	...	...	...
3	Nitrate of soda.....	110	110	441	237	154	277	257	189	175	207
4	Nitrate of soda.....	440	...	...	...	...	...	327	181	225	244
5	Nitrate of soda.....	220	220	448	257	138	281	349	192	209	250
6	No fertilizer (check)..	...	...	373	167	151	230	257	162	146	188
7	Superphosphate	470	...								
	Sulphate of potash....	125	...								
	Nitrate of soda.....	220	...	384	208	154	248	293	171	151	205
8	Superphosphate	470	...								
	Sulphate of potash....	125	...	467	159	123	249	239	157	118	171
9	Nitrate of soda.....	220	...								
	Sulphate of potash....	125	...	438	197	148	261	289	173	135	199
10	Nitrate of soda.....	220	...								
	Superphosphate	470	...	368	185	132	228	212	114	115	147
11	Sulphate of potash....	125	...	292	247	127	222	229	154	114	166
12	Superphosphate	470	...	292	198	123	204	313	124	142	193

Loganberry Culture, Etc.

Continued from page 6.

tightly as possible so not to allow them to be baggy or in bunches. A well-trained patch has great advantage in cultivating and picking. When the berries are all harvested (which is about the last of July) the old vines are cut out and the new canes trained up. The old vines are usually cut up with a small disk harrow, using enough weight on same to accomplish this. The vines disposed of in this way make a good fertilizer for the soil and an economical method of disposing of them. When I began growing these berries I paid fifteen cents per crate of twenty-four pounds for picking; later the price was raised to twenty and then to twenty-four cents, or one cent per pound, which was the established price; although last season we paid a war price of one and one-half cents per pound. We usually commence picking about the twentieth when season is normal. Most of the berries are gathered by women and children, who come out from the cities for a summer outing and help make their winter's supply. A good picker will make from two to three dollars per day, depending upon conditions and their "stick-to-it-ness." The yield varies from three to six tons per acre, averaging about four tons. In the past the price has varied considerably, but the last two or three years has been on a more established foundation, ranging from three and one-half to five and one-fourth cents per pound. Term contracts can be secured at present from reliable sources for a period of five or ten years at a price around four cents per pound. This season's crop is being contracted for at six cents per pound or better. In recent years there has been a good demand throughout the world for the dried product, the canned article is fast gaining in favor and the juice industry, while yet in its infancy, with the world for a market, is destined to become a winner. Those who choose and the ones pursuing this industry are sure to be greatly rewarded for their efforts.

Worm Injures Grape Vines

In reply to a letter reporting injury to grape vines by a black and yellow worm, Dr. A. W. Morrill, consulting entomologist of the University of Arizona, writes as follows:

"This worm is known as the grape-leaf skeletonizer. It is marked with yellow bandings across the back, and, in the adult form, is a deep, bluish moth, somewhat resembling a wasp. It is sluggish rather than active like most moths. The eggs are laid in clusters on the leaves of the grapes and the young have the peculiar habit of feeding in rows. They do not spread out over the plant, at least until they have skeletonized the first leaf and are forced to travel to other leaves for food.

"Ordinarily these worms are active when the vines are loaded with the berries, and for this reason it is usually not desirable to apply poisons. There would be no danger, however, in poi-

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The FRUIT GROWER says=

"for tree planting genuine GIANT is most satisfactory"

The Giant Farm Powders—Eureka Stumping and Giant Stumping—**loosen and pulverize** the soil instead of packing it and throwing it high in the air.

Western fruit growers have used hundreds of tons of these Giant Powders for blasting beds for trees. They have proved that blasting with genuine Giant Powders provides free drainage, increases moisture-storage capacity and insures vigorous growth and early bearing.

"My trees planted three years ago in beds blasted with Giant Powder are 75 to 100 per cent bigger and better than the trees that I planted in dug holes," writes H. H. Smith, Oregon City.

You will enjoy reading "Better Farming with Giant Farm Powders." It describes all the new and money-saving methods of blasting beds for trees, subsoiling established groves and orchards, clearing land, ditching, etc. Write for it now.

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GIANT FARM POWDERS

STUMPING EUREKA

soning the vines before the grapes are half grown, and, of course, there will be none after the crop is picked. When poison can be used, powdered arsenate of lead is recommended at the rate of one ounce in a gallon of water.

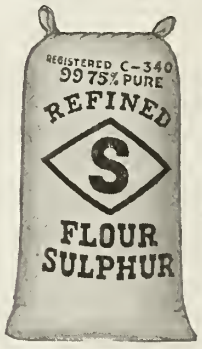
"First attention should be given to controlling these insects by other means than spraying. During the winter season the leaves and weeds in the vineyard should be thoroughly cleaned up and burned. After the leaves appear in the spring a close watch should be kept of the vines, and when the first lot of young larvæ is discovered the vines should be gone over and all the infested leaves removed and burned as far as practicable. It is advisable to go over the vines in this way every five or six days after the first larvæ are discovered. If there are no other vineyards in your neighborhood, and your efforts to locate the colonies of the larvæ are successful, you will probably have very few, if any, of the worms during the season when they are normally most abundant. This period is very likely to be when the grapes are maturing. If you can keep the insects in check by the hand-picking method until the crop is nearly mature you can afford to discontinue the work after the fruit is picked, when the vines can be sprayed with arsenate of lead. It is possible that the worms could be killed by spraying with helebore, or a solution of buhack powder. These substances will not poison the fruit. I have not tested either of them against the grape-leaf skeletonizer. If you adopt the foregoing suggestions in regard to hand picking the infested leaves and find that it is requiring too much time, then I would suggest that you try the use of helebore or buhack powder. The helebore should be used at the rate of one ounce steeped in two quarts of water, and the buhack should be used at the rate of an ounce of the powder mixed in one quart of hot water."

Consider Bees When Spraying

By A. L. Melander, Entomologist Washington State College, Pullman

In his desire to overwhelm the codling moth the fruit grower should not overlook the rights of the honey bee. Undoubtedly many bees are killed by poisonous sprays; so many, in fact, that prominent beekeepers have declared their intention of removing their bees from the orchard districts to the safer alfalfa fields. Such a condition can be largely avoided, and should be avoided. There is no justification in fruit growers slaughtering honey bees when the bees, through their pollinating visits, are so beneficial to the fruit trees. These insects ordinarily outnumber the other pollinators a hundred to one and materially help to increase the setting, maturing, sizing and coloring of fruit. It is to the mutual interest of beekeepers and fruit growers to work harmoniously together, for bees are as important to the orchard industry as fruit blossoms are to honey production.

SULPHUR



It has been proven and so recommended by the University of California that if you sulphur your grape vines and orchards 6 times they will not be affected by MILDEW or RED SPIDERS.

ANCHOR Brand Velvet Flowers of Sulphur, also EAGLE Brand, Fleur de Soufre, packed in double sacks, are the fluffiest and PUREST sulphurs that money can buy; the best for vineyards; the best for bleaching purposes, LEAVING NO ASH.

Try our new brand of VENTILATED Sublimed Sulphur, 100 per cent pure, for making Paste —(Atomic Sulphur) and for Dusting.

For Lime-Sulphur Solution, use our DIAMOND "S" Brand Refined Flour Sulphur. We can furnish you this sulphur at such a low price that it will pay you to mix your own solution.

To create additional available plant food, drill into the soil 100 to 400 pounds per acre of our Diamond "S" Brand Powdered Sulphur.

It has been proven that sulphur has increased various crops up to 350%.

Write immediately to

San Francisco Sulphur Co.
624 California St. San Francisco, Cal.

We are equipped to make immediate shipment. Send for illustrated booklet, price-list and samples, and please state for what purpose you use the sulphur, quantity needed, and date of shipment preferred. Tel. Kearny 871.

Your Tractor Question —"Will It Do MY KIND OF WORK?"

Answered in Tractor Book

TrackPULL book tells all about *special abilities* of Bean TrackPULL Tractor in *orchards.*

This great little 6-H.P. machine, designed by builders of special orchard machinery for 34 years, combines a wealth of experience in one most efficient design to meet definite orchard needs.

Don't buy tractor built for *general* use which may prove merely an expense, no matter what the purchase price.

Tractor designed to *do your kind of work* is the cheapest by far in *service-costs* per year.

TrackPULL turns about-face in 10-foot circle with *full* power—tools deep in soil. You turn right back in same row.

Built low to go under lowest branches. Great traction permits light weight, low fuel expense, and best work in soft soil.

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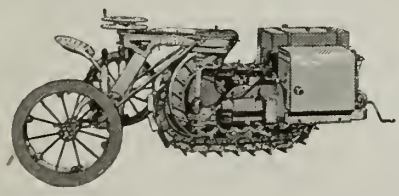

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We have a new "After-the-War" proposition which includes a bond covering the liberal guarantee of one season's work of 90 days, without expense for repair parts. This guarantee bond is furnished each purchaser of a BEAN. A reduction in price is also effective at once, and guaranteed up until June 30, 1919.

Also manufacturers of famous Bean Power Sprayers

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Send me TrackPULL catalog and full information without obligation on my part.

Name.....

Street.....

City.....

County..... State.....

No. of Acres..... Kind of Crops Grown.....

A notion that bees spread fire-blight is mostly error, for the damage done by bees is small as compared with flies, mites, aphids and plant bugs. If bees carried this disease blossom blight would be much more prevalent than it is, since normally every fruit blossom is visited many times by honey bees.

While some states by law have forbidden the spraying of fruit trees in blossom it should be unnecessary to compel fruit growers to abandon a practice that is detrimental to their interests. When fruit trees first blossom forth the opening of the petals is accompanied by a development of nectar and the flowers are visited by myriads of honey bees. The combination of color, perfume and honey is Nature's elaboration to induce bees to visit and to cross-pollinate the blossoms. If cross-pollination were inconsequential and unnecessary fruit trees would not expend their energy in developing flowers and honey. Investigations at the Oregon Experiment Station have demonstrated this point, showing that most varieties of apples are self-sterile, and that cross-pollination is the rule and self-pollination is the exception.

Many beekeepers report poisoning of bees and brood following the summer cover applications. In such cases it appears that the main harm occurs in orchards having an alfalfa or vetch cover crop, which for this reason are frequented by bees. During the dry summer weather bees become thirsty and will drink arsenical spray, but it is the drip on the alfalfa from over-spraying that is taken rather than the spray on the foliage. To be properly sprayed a tree will require a certain definite amount of liquid which is dependent not on the pressure or the nozzle used, but on the shape of the tree, the amount of foliage, the number of blossoms or fruit and the kind of spray used. Applying more spray liquid beyond the necessary amount does not accomplish better spraying, but is a waste of time and material. For several other reasons it is inadvisable to over-spray: the particles of spray-liquid gather together and leave an imperfect coating and the drip on the cover crop is a danger to stock later eating the alfalfa hay.

The suggestion has been made that orchardists add a repellent to their arsenical to deter the bees from drinking it. However, this is not altogether practical, since an efficient repellent has not been discovered that would discriminate between the bees and the codling worms, and the value of an arsenical spray is dependent on the worms partaking of it.

Wanted to hear from owner of good farm for sale. State cash price, full particulars.

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MINNEAPOLIS, MINNESOTA

NO RISK

Your orchard is your business. Its care is important. The more you know about it the more certain the success. Knowledge is power in the orchard business as in everything else. You cannot afford to take chances with tree sprays.

"ORCHARD" Brand Arsenate of Lead Paste

AND

"ORCHARD" Brand Dry Powdered Arsenate of Lead

are the only tree sprays you would buy if you chemically analyzed all brands and knew all the facts.

They are the only sprays you would buy if you were not influenced by the self-interest of others.

They are the only sprays to buy to insure a crop—can you afford to to take chances?

"ORCHARD" brand Dry Powdered Arsenate of Lead is recommended because it is douhle the strength of the paste.

We are not alone manufacturers of Arsenate of Lead; we are partners in your business to the extent that we must deliver you the tree spray materials that will get results.

Dry Powdered Arsenate of Lead is a finely divided powder that mixes readily with water and remains in good suspension when diluted in the spray tank.

We know of no spray equal to Dry Powdered Arsenate of Lead to control Codling Moth and similar insects. Use two pounds to a 100 gallons of water.

"ORCHARD" brand Standard Arsenate of Lead (paste) is manufactured on the Pacific Coast, under Western conditions, for Western fruit trees. It does not contain less than 15% Arsenic Oxide, not to exceed 50% water, and not to exceed 0.5% soluble arsenic.

Long experience in manufacturing Arsenate of Lead for tree spraying on this Coast, and a constant observation of the results obtained by its use, enables us to produce a soft, creamy paste, by chemical and mechanical processes, that does the work as you want it done.

General Chemical Company
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Royal Insurance Building
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ACME **Corrugated Joint Fasteners**

Make Strong 2-Piece End Boxes.

Acme Patented Divergent Saw Edge Fasteners will not pull out and holds better than cleats or glue.

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Farmers, Fruit Growers and Home Owners

ATTENTION!

Write for our big descriptive catalogue and prices for trees delivered to your nearest railway station, freight paid.

PEARS PAY. Chester Ferguson, of Yakima, Washington, realized an average of $2,016 per acre for pears this year, 1918. **PLANT PEARS.**

Agents wanted to represent us in each locality. Address

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CORNER FIRST AND OAK STREETS
PORTLAND, OREGON

Productive Mortality of Prunes

Continued from page 10.

that irrigation, if practicable, would remedy the matter. Many orchards, however, are located in the hills, where it is out of the question to practice irrigation.

Successful orchardists attempt to increase the humus content of the soil by turning under cover crops of vetch, oats or rye and, when it may be secured, manuring heavily. The stand of a cover crop depends upon the weather conditions in September, largely, and many failures occur. Every crop that is turned under increases the chance for succeeding with the next crop, since it adds to the humus content, which in turn holds the moisture better and the soil does not dry out so quickly in the summer. The usual practice is to sow the cover crop in August or early September, previous to the harvest rains. Orchards that are deficient in humus are, as a rule, also lacking in nitrogen, since the humus has a tendency to prevent the burning out of this valuable element in the summer and the leeching away during the rainy season. The vetches add nitrogen, and it is common observation that orchards respond quickly to this practice. The soil becomes easier to work early in the spring, does not run together badly in the winter and holds the moisture better in the summer. The trees take on a darker-green hue, the fruit hangs on better and is larger. We know of one grower who secured $1,248 from two acres simply by plowing under large amounts of manure for several successive seasons. Another man got splendid results with sheep manure which he was in position to procure, causing the old orchard to take on renewed life and to bear heavily.

Manure is not available in most of the prune sections, and we have been watching with interest a number of prominent growers who have been reduced to the expediency of using nitrate of soda, a quick-acting nitrogenous fertilizer of great value. This was first brought to the notice of fruitmen in the Northwest by the Hood River Branch Experiment Station, where some very remarkable results were secured in rejuvenating old apple orchards. These prune men, despite the wartime price of the fertilizer, assert that $30 an acre added in the form of a quick-acting chemical plant food is well worth the cost. If no other effect than to stimulate new growth is secured the investment, theoretically, would be repaid. A Douglas County grower, noted for his progressiveness, claims after one season's trial that the fruit avoided the unusual pre-harvest drop of last season, leaving the prunes to increase their weight appreciably. A heavy use of nitrates is expected in the Umpqua Valley this spring. Through the county agent enough orders have been secured for a carload, which by this co-operative effort will reduce the cost very much, bringing it within the reach of the average grower.

A close study of the crop and acreage figures of the Northwest discloses a condition not generally suspected. Prune men assert with a great deal of optimism that the tonnage will increase many fold in the course of the next few years. Is this really the case? It can be recalled that the danger of overproduction has been preached every year for a number of years and yet the figures prove that the crop increase is far from keeping pace with the acreage coming into bearing each year. We thus come back again to the problem of old age, senile deterioration, decrease in production or whatever we are a mind to term it. For want of a better term, the writer has chosen the expression "productive mortality" to indicate the condition existing when, without actual death, the productive capacity of the old trees falls off with great rapidity. All observations show that this "productive mortality" is far greater than has been suspected.

Every industry has its deterioration charge reckoned on a basis of the cost of replacing the wear and tear. Horticulturally speaking, this would be calculated in terms of the acreage necessary to be planted each year to make up for the "productive mortality," or to keep the industry up to normal. Considering this matter from a theoretical viewpoint, for instance, suppose we assume that with a given 1,000 acres of prunes a 10 per cent productive mortality is recorded. This would mean that a hundred acres planted each year would simply keep up the average production instead of increasing the total production by another hundred acres each year, which is the way most estimators figure. What, then, is the productive mortality rate of prunes?

Douglas County had a crop of 8,500,000 pounds of dried prunes in 1918. During the last eight years a large acreage of trees have come into bearing, adding their crop to the crop of the older trees. The 1918 season was certainly a normal prune season, and this figure does not represent a short year, yet on referring to the yield of 1910 we are somewhat surprised to learn that the crop was 7,500,000 pounds. In short, the additional acreage coming into bearing for the last eight years has made little increase in our total production; this, too, when we know that it is these young tracts that bear the heaviest.

Nice Bright Western Pine
FRUIT BOXES
AND CRATES
Good standard grades. Well made. Quick shipments Carloads or less. Get our prices.
Western Pine Box Sales Co.
SPOKANE, WASH.

NOW is the time to send to
Milton Nursery Company
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FOR THEIR 1918 CATALOG.
FULL LINE OF NURSERY STOCK.
"Genuineness and Quality"

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TRADE MARK
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IMPROVE = PROTECT
YOUR FRUIT CROP
Arsenate of Lead

For thirteen years the GRASSELLI BRAND has been used throughout the fruit growing sections of the Northwest where it has given unvarying satisfaction to the user because of its all-round good qualities:

IT kills the worms.
IT sticks well to the foliage.
IT is high in suspension qualities and will always be found dependable and uniform.

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Established 1839
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NO SUPERIOR FOR SPRAYING
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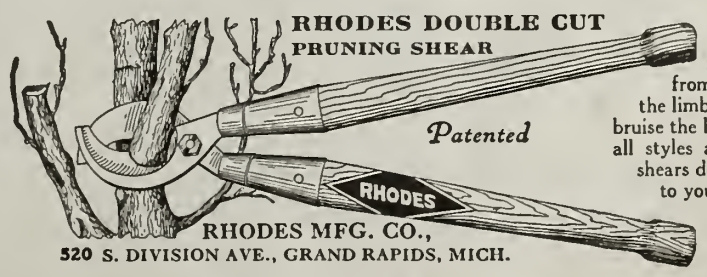

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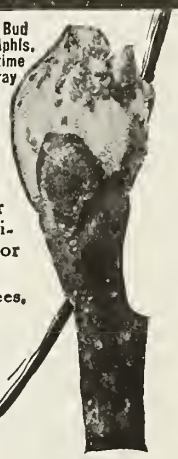
Kill Aphis

Before Aphis Kills Your Profits

This tiny, sap-sucking insect, scarcely larger than a pin-head, is destroying apple profits all over the country. Feeding with its sharp, mosquito-like bill, it causes dwarfed, deformed, unmarketable fruit. Curls foliage. Weakens trees. Spray with

Black Leaf 40
40% NICOTINE



and control Aphis, Red Bug, Leaf Hopper and other soft-bodied, sucking insects. Aphis is making its appearance in many sections for the first time. Regarded by many growers as the most destructive apple insect. One aphid produces thousands in a few weeks. Spray with Black Leaf 40 and save your profits. Can be used with lime-sulphur, arsenate of lead, bordeaux and other sprays as recommended, or may be used separately, if desired. Mixes perfectly with water. Costs only about 1c per gallon diluted for the trees. Recommended by agricultural colleges and experiment stations. Send for

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showing when and how to spray and how to protect fruit trees, vines and vegetables from these profit-killing insect pests.

The Kentucky Tobacco Product Co.
Incorporated
Louisville, Kentucky

Statistics for Marion County show that there are 2,083 acres five years and under, an average of 400 acres per year that will come into bearing in the next five years. Assuming, since we have no way of checking exactly, that an average of 400 acres a year has come into bearing in Marion County during the last eight years, which would give 3,200 acres of the heaviest producing trees, we learn with surprise that at the average rate of production of 2,400 pounds per acre, which was the Marion County figure for 1918, close to 8,000,000 pounds of the total crop of 12,000,000 pounds came from orchards under thirteen or fourteen years of age. In short, it seems that the orchards which should now be in the prime of life, above fourteen years, produced only 4,000,000 pounds of the 12,000,000 pounds. Does anyone suppose that in 1910 the yield was only 4,000,000 pounds? Here, then, we have a way of calculating the rate of decrease of productivity which brings us back once more to the original question asked at the beginning of this article, "When is a prune tree old?"

A study of these figures indicates that the decline is rapid after the fifteenth year, yet every prune grower knows of orchards which are in heavy productivity at more than twenty-five years. A thirty-year-old orchard belonging to County Commissioner Edwin Weaver of Myrtle Creek, yielded two and one-half tons to the acre in 1918, and, better than that, over two and one-half tons in 1917 and three and one-quarter tons in 1916. When the high prices subside it is expected that the care which many old tracts are now receiving will be replaced by easier methods, which will quickly reduce the tonnage now secured from the old orchard. With better facilities for marketing prunes, with an educated consuming public and with a standardization of the product, is the danger of overproduction as apparent as we are often given to believe?

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Rex Dry Paste
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A pure white corn product that will not stain the most delicate label. Thousands of canners and labelers swear by Rex Paste.

Convenient to use, as Rex mixes readily with cold water.

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Use 200 pounds of Nitrate of Soda broadcast per acre in late February or early March, or use at Blossom Time.

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Comparative Results, Etc.

Continued from page 5.

The information procured from the standpoint of codling-moth control during the past three years is also more or less irregular. Years that are favorable for scab development are usually unfavorable for the development of the codling moth. The information obtained in 1916 was practically nil. Generally speaking but one generation of the worms appeared in the Hood River Valley that year owing to cold weather that prevailed practically all summer. During that season at harvest time but 1.2 per cent infestation was present on the unsprayed trees at the time the fruit was picked. (The first brood infestation was not checked, apples from which dropped and decayed.) On the dusted block an infestation of 1.9 per cent, or more than that observed on the dusted trees, was recorded, while no worms were found on the sprayed trees. The percentages are so small as to be within that allowed for experimental error and cannot be considered as reliable.

In 1917 dusting work was continued in three different orchards. This season proved a good one for codling-moth development, worms continuing active right up to picking time. The results obtained, however, in the final analysis are to a considerable degree contradictory. As indicated by the degree of infestation in the different orchards on the unsprayed check trees the crop of over-wintering worms was quite variable. During the season in checking up the worm injury both stings and actually wormy apples were tabulated, giving as a result total worm injury. In one orchard the unsprayed trees developed 72.56 per cent worm injury, 54.49 per cent of the fruit being actually wormy and the balance stings. The fruit on the dusted trees, which was given six applications of arsenate of lead, developed a total worm injury of 4.05 per cent—8.99 per cent of which was actually wormy. In the sprayer block 14.87 per cent occurred, of which but 1.62 per cent contained living worms or apples in which they had entered. The dusting in this orchard was very carefully done by the writer—as was the case of all of the dusting work—and the results seem to indicate that the dust is much less effective where there is present a severe infestation with which to contend. In another orchard the check trees developed 42.34 per cent infestation with 24.07 per cent actually wormy. The dusted trees developed 24.73 per cent injury with 6.48 per cent actually wormy. On the sprayed trees in this orchard 8.93 per cent worm-injured fruit was found, of which but 1.83 per cent were fruits in which worms had entered. The average orchardist would not consider control of this degree on the part of the dust sufficiently effective to warrant its use. In the third experimental orchard during 1917 the infestation was very light; the check trees developing 6.8 per cent injury, of which only 2.71 per cent were actually wormy. This loss was reduced to 2.34 in the dust area, while the adjoiing sprayed trees developed worm injury to the extent of 3.27.

In 1918 the dusting work was continued in but two orchards; the last two above described. In neither orchard was the presence of worms excessive. The fruit on the unsprayed check trees in one orchard developed 16.85 per cent worm injury (stings and wormy fruit), while on the dusted and sprayed trees 5.17 and 4.6 per cent, respectively, occurred. In the second orchard 21 per cent occurred on the unsprayed trees, while a loss of 4.92 and 1.14 per cent occurred on the dusted and sprayed trees. Control for 1918, then, could be considered very satisfactory from the standpoint of both methods.

In summarizing the results of the three years' work, it was observed, with the exception of one orchard, during one season the control obtained with the dust must be considered quite effective, though in but one or two instances did the results equal that obtained by the liquid.

Careful records have been kept relative to comparative costs of operation and materials from the standpoint of

YOU can't help getting jimmy pipe or cigarette makin's happy every time you fire up with Prince Albert—it pleases you so fair and square. You just can't get enough hours in the days and nights to put to smoking purposes. That's the situation!

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Soon as you know Prince Albert you'll say that P. A. *did not* bite your tongue or parch your throat. *And, it never will!* For, our exclusive patented process cuts out bite and parch and lets the man with the touchiest tongue simply smoke his fill all the time.

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The orchard needs a top dressing of quickly-available nitrogen, and will respond to it just as quickly and surely as timothy, winter grains or vegetables. Nothing brings young orchards into bearing so quickly or keeps the older trees in profitable condition so surely.

The best nitrogenous fertilizer for orchard use is ARCADIAN Sulphate of Ammonia. It carries more ammonia (25¼% guaranteed) than any other, consequently less freight. It is all soluble, quick acting and all available, besides being easy to spread by hand or by machine.

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ARCADIAN Sulphate of Ammonia is the well-known standard article that has done you good service in your mixed fertilizers for years past. Especially kiln-dried and ground to make it fine and dry. Ammonia 25¼%. Made in U. S. A. Arcadian is the *Great American Ammoniate.*

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For Information as to application, write The Barrett Company Agricultural Department

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Codes: A. B. C. 5th Edition and Modern Economy

dust versus liquid. In the case of liquid applications some figures are available with reference to the use of spray gun and spray rod. A detailed account of cost records will not be presented in this article. In summarizing, it might be said that records were taken on three acre units, trees upon which were 14 years of age. As an example of this in 1917 six applications of spray were used to control apple scab and codling moth. In some of the applications the lime sulphur—or dust sulphur—and arsenate of lead were used separately and at other times in combination. The complete record shows that from the standpoint of cash outlay to the grower the comparative costs are about on a par—the dusting method being slightly more costly. It was found that it took two men thirty-six and one-half hours to spray three acres six times with rods, while the same acreage was dusted with the same crew and team in eight hours. On the face of figures submitted it would then appear, taking all things into consideration, especially the time element, that the dusting system had the edge on the liquid method. The 1917 figures, however, were obtained before the spray gun came into use in the Hood River section. The figures that have been submitted, however, do not give the various factors that have to be taken into consideration in applying a good coat of dust—and herein lies the one great factor which makes its use impracticable under Hood River conditions. This all-important factor is the uncontrollable wind. Wind, and to be more explicit, a very slight breeze, paralyzes the dusting method. It not only makes the accomplishment of good work impracticable but impossible. In employing the dusting method for pest control the air is considered the carrier. The dust is thrown with force into this theoretically quiet medium, and so thrown covers the under surfaces of the fruit and foliage. In hovering and slowly settling the upper surfaces are coated. With conditions exactly right a wonderful coating can be given a tree in all of its parts, a coating which has remarkable adhesive qualities. With a light breeze blowing—and this means light in its strictest sense—the properties involving the carrying qualities are greatly impaired. Instead of the materials naturally hovering over the trees as is the case in quiet atmosphere, a large percentage of the minute particles quickly pass by the fruit and foliage, a large percentage of which is lost. Only those particles which actually strike surfaces—and perhaps not all of them—stick. The result is a loss of a large percentage of the materials

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used and an incomplete and ineffective coating. Some control might be obtained under these conditions, but we have to contend with more than a light breeze during a greater portion of our spraying season. Ours is a real breeze, and in some sections in fact might be called a wind. With a breeze of considerable magnitude blowing, effective work is absolutely prohibited. The trees cannot be reached for more than half their heights and the material that is used passes by and out of the orchard with the speed of an express train, taking no time to alight upon fruit or foliage. In Hood River during a greater part of the spraying season our atmospheric conditions are inclined to be windy. This condition existing often weeks at a time with only a let-up usually very early in the morning. The dust was applied in practically all of the writer's experimental plots between 4 and 6 o'clock in the morning, and even at this hour the work quite often had to be postponed to a more favorable day. After 8 o'clock in the morning it can safely be stated that there would be too much air current present at Hood River to permit effective work with dust.

Several orchardists in this section possess power dusters. I have noticed that practically all of them have dusted under weather conditions that could not be called favorable. During the past fall countings of fruit were made in a number of these orchards. Though no scab was present—a condition which was general—the losses resulting from worm infestations were excessive, ranging from 15 to 45 per cent. Most of these growers look now with more or less disfavor upon this method of insect control. There is nothing magic about applying dust. If it does not cover the tree each time that it is used, control of a given trouble cannot be obtained. Our unfavorable weather conditions do not tend to assist the grower along these lines and many are inclined to dust when the weather is not right and let it go at that. This practice can only result disastrously.

The fact that the use of dust is not adaptable to the control of all of our orchard pests makes its use in the average orchard impracticable. The possession of a duster increases the overhead and the average orchardist cannot support much more than he is doing at the present time. Perhaps I have condemned this system—very meritorious—in many respects, excessively. It, however, is not adapted to the average Western orchard, and the only real purpose that I can see for it is as an auxiliary to the liquid method in orchards of large acreage. Occasionally conditions arise that demand a quick application of spray, and under these conditions the duster would come in handy provided, of course, existing weather conditions would permit favorable work.

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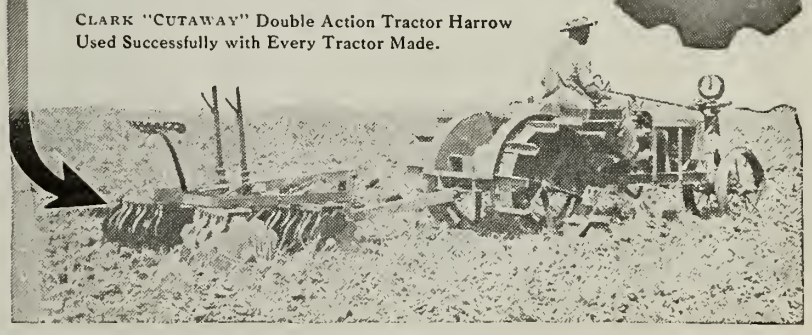

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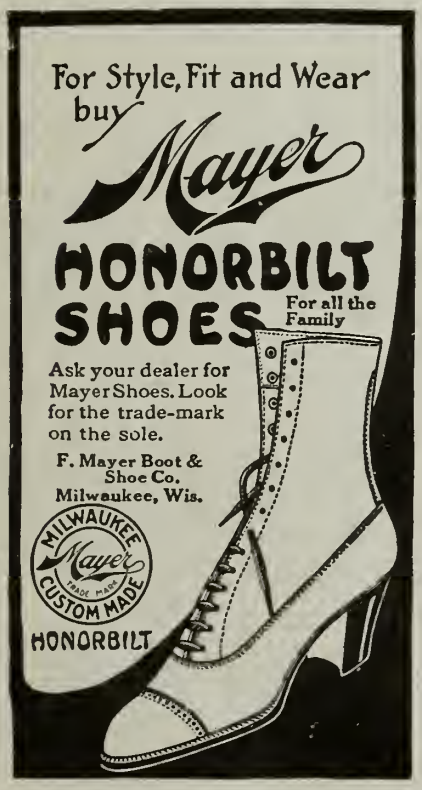

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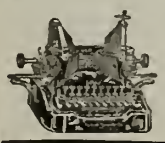

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As an Eastern entomologist has stated, "the dusting method would have died a'bornin'" had the spray gun and high-powered sprayer appeared earlier. I believe that his judgment is sound in this respect. We have not had time to test out the gun under all conditions, but preliminary work seems to indicate that it will in a large degree fill the bill. This is particularly true of the new ten-horsepower, four-cylinder sprayer that is becoming popular in the Hood River Valley. This machine is capable of maintaining three guns at a minimum pressure of 250 pounds. Several growers operate their machines in this manner, one man riding on top. The machine passes up and down each row, making necessary only a moment's stop for each two trees. The spraying of a large acreage per day is readily accomplished. Figures for the 1918 work, not all available at the present time, however, from data in hand two men on this high-power sprayer can cut their time in two and do the work much more easily than they could with the 12-foot rods and small outfit.

In some cases the old three and three and one-half horsepower outfits were found capable of handling two guns. A little more than a third of the time was saved as compared to the time used with rods. This was also accomplished with much less effort on the part of the rodmen. In other words, the appearance of the spray gun has in a large measure taken the sting out of spraying, making easy work of what used to be decided drudgery. The handling of the gun on the part of many orchardists, however, has not been perfected. Some growers are inclined to take too much for granted with a result a good many tree tops were supposed to be covered when in reality they were not. This seems to be more particularly true where the gun has been adapted to the sprayer of low power. Some growers with good outfits were inclined to establish speed records with a result their crop suffered. Care must be taken with the gun just the same as is done with the rod.

Some comparative figures are available with reference to codling-moth control during the past season. In three different orchards rods versus guns were tested. In all three of these orchards slightly better control was obtained with the rods than with the guns. These percentages ran as follows: Gun, 4.95 per cent; rod, 2.38 per cent; gun, 7.46 per cent; rod, 4.34 per cent; gun, 9.98 per cent; rod, 6.64 per cent. In one of these orchards, the last cited, the power outfit is a small one. The fruit at harvest time was analyzed as it came from the trees, that is, the fruit from the ground to twelve feet was separated from those higher. The difference in condition was very marked. The lower fruits were practically free from worms, though some stings were present, while the upper fruits were in very bad shape, a big percentage of which were wormy. This condition was observed in a good many orchards, more noticeably where small

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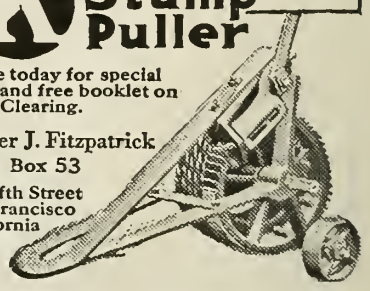

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machines were used. The only answer which can be applied to this condition is that the fruit was not sprayed thoroughly.

In checking up the experiments wormy apples were classified according to the location of worm entrance; that is, whether the worm had entered the fruit through the side or calyx. Classification of this sort has been carried on in the dust blocks as well, in order to get a line on the actual need of a driving spray. The writer has contended for many years that the idea of forcing spray to the bottoms of the calyx cups was, in the case of the majority of young fruits on the tree, unattainable and as a matter of fact not obtained, regardless of the fact that many entomologists still advocate the absolute need of a spray of this type. The fact that we get good control of calyx worms through the use of the dust and the spray gun, particles of spray in the case of the latter being broken up before reaching the majority of young apples, indicates clearly that the fine misty application carries with it greater effectiveness than the coarse splattering spray so often advocated for the calyx spray.

As an example of the effect of the dust or a mist application for the control of calyx worms the following figures are available: In a block of Newtowns in 1917 the following ratio of calyx and side worms occurred: On the unsprayed check trees 33 per cent of the worms entered the calyx, 66 per cent the side. In the dust block 100 per cent of the worms entered the side of the fruit. In an adjoining block of sprayed trees, using a fine mist, the ratio was 14 per cent calyx entrants, 86 per cent side worms. During that same year in an orchard of Arkansas Blacks the following figures were taken: Unsprayed check trees, calyx worms 68 per cent, side worms 32 per cent. Dust block, 28 per cent calyx entrants, 71 per cent side. Sprayed block, mist application, 20 per cent calyx and 80 per cent side entrants. In 1918 where the gun was used the ratio was found to be 1 per cent calyx entrants and 89 per cent side worms.

In the use of the spray gun throughout the Hood River Valley during the past season, it appeared to the writer that for the most part more effective work was accomplished with more parts of the trees thoroughly coated than has usually been attained with the unwieldy spray rod. Growers with small outfits were inclined to neglect the tops of the trees, while those growers using high-power machines often over-sprayed the lower parts of the trees. This over-application in the earlier lime-sulphur sprays resulted in considerable defoliation and foliage burn. This action apparently had no visible effect upon the fruit, as trees so injured produced a full crop, recovering their foliage completely during

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early summer. Foliage injury, however, should be reduced to the minimum as far as possible in order to avoid any immediate or cumulative injury to the tree which might result. Excessive drenching can be avoided. With these two exceptions the gun gave a good account of itself in every way at Hood River, and it was used by a majority of the growers. Most of the orchardists state, "We will quit the orchard business if we have to go back to those man-killer rods." With this viewpoint in mind, the grower will undoubtedly make it a business to see that his spray gun makes good.

To Fight Proposed Rate Increase

Half a million dollars is the stake for which the fruit growers, fruit shippers and business men of the Wenatchee district are preparing to wage the battle of their lives before the Interstate Commerce Commission at Washington this spring. Joining in this contest will be all the other fruit districts of the Pacific Northwest as well as the Public Service Commissions of the four Northwestern States, Washington, Oregon, Idaho and California. These forces will combine for the purpose of opposing the proposed increase in the United States Railroad Administration's freight tariff on fruit, also the greatly advanced charges for heating and icing fruit in transit. The freight rate increase is already in effect, having been temporarily suspended by the Interstate Commerce Commission last October until May 31. The other increases have been promised but have not yet gone into effect. Under the new schedules the charges for icing and heating will be raised 50 per cent in some instances.

The Wenatchee district alone will have to pay $500,000 more to have next year's fruit crop shipped to the market if these advanced charges are not defeated or suspended. Altogether the fruit industry of the West will pay an additional toll of several million dollars annually so that the stake in the coming battle will be one of princely proportions.

Wenatchee fruit shippers took the iniative in opposing the first increase in freight rates on fruit two years ago. At that time the advance only amounted to 15 per cent of from $1 to $1.15 per hundredweight from here to Mississippi River points.

The special committee of the Wenatchee Commercial Club, consisting of Chairman Frank D. Case, O. B. Shay, John A. Gellatly, W. R. Prowell and C. B. Hughes, is now preparing to organize the final campaign against the advanced charges.—*Packer.*

The Cashmere Apple Company have prepared plans for a three-story frost-proof modern warehouse to be erected in Wenatchee in the near future. The work will be carried on as rapidly as possible after the contract is let, so the warehouse will be ready for the 1919 crop.

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